THE IRON TRADE REVIEW

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PIG IRON SHORTAGE

CAUSES CARNEGIE STEEL CO. TO ENTER THE MARKET.

Large Sales of Southern Iron.—Northern Pig Market Quiet, But Prices Are Firm.

The most interesting development of the week in finished lines was the action of agricultural implement manufacturers in appointing a committee to endeavor to obtain a concession of $2 per ton on the price of steel bars for their annual contracts for the year ending June 1, 1908. Manufacturers state emphatically that no concession will be made. The dissatisfaction caused among other buyers of steel bars last year, when a reduction of $2 per ton was made to agricultural interests, and the great demand for all kinds of finished materials this year, tend to make the mills very firm in their position.

Bessemer Pig Purchase. The purchase of 5,000 tons of Bessemer pig iron by the Carnegie Steel Co. for March delivery at $22, valley furnace, indicates that the output of the Carnegie furnaces is still inadequate, and it is expected that further purchases will be made. Sales of about 75,000 tons of southern pig iron are reported, and in spite of some weakness in the Chicago market, the southern product is strong. Transactions in northern foundry pig iron are not numerous, but the market is firm.

Crude Steel Bought. The Carnegie Steel Co. has purchased 10,000 tons of billets from the New York State Steel Co., Buffalo, which recently completed its new steel plant having a capacity of about 500 tons daily. The demand for structural shapes continues to show improvement. Coke is somewhat easier.

RAILROAD BUYING.

Whatever lull has been experienced in the iron trade since the first of the year has been attributed to the alleged retrenchment policies adopted by some of the leading trunk lines. Postponements of rail and car deliveries by a few of the roads have been magnified by those who have been forecasting a slump in iron and steel values, and the reports that have emanated from certain financial centers have been indicative of a general curtailment of purchases and a suspension of shipments of material already ordered. In fact, however, only two roads of prominence have concluded that the retrenchment period has arrived—the Wabash, which has temporarily suspended operations on all new undertakings, and a western road, which in its mad rush to the coast has been expending an average of $1,000,000 monthly. Despite this curtailment the latter system has recently promulgated a list of machine tool requirements which will cost approximately $100,000, and which indicates that its more important extension work alone has been affected.

The Grand Trunk is proceeding with the erection of shops at Battle Creek, Mich., which, when completed, will represent an expenditure of $5,000,000, machine tool builders only recently having been asked to figure on the equipment requirements. The Big Four is likewise going ahead with the erection of its new shops at Indianapolis, which will require at least four years to complete.

It is frankly admitted by the rail makers that there has been some readjustment of shipments, due to the postponement of deliveries for a few of the roads, but in no instances have the manufacturers been embarrassed, as other roads anxiously awaited an opportunity to step into the breach. On March 1, the rail bookings of the Carnegie Steel Co., for 1907, were within 80,000 tons of the total ordered last year, and the indications are that the phenomenal record of 1906 will be surpassed in the remaining ten months of this year.

Nor is the situation, as reported, regarding the car builders, borne out by the facts. As in rails, there has been a readjustment of shipments, but these deferred deliveries have in no degree resulted in a curtailment of the output of any of the car plants. Most of the roads were anxious to have their orders brought forward, the car shortage still figuring as the all important factor preventing the satisfactory movement of freight.

During the first two months of this year, it is estimated that contracts for no less than 40,000 cars were placed, one manufacturer alone having been awarded 22,000 of this total. In further refutation of the curtailment charges it can be reliably stated that the majority of these cars are for delivery this year and only a few of the builders are in position to make reservations before December. Time of delivery, rather than price, governed the placing of practically all of these orders, and instead of reducing the accumulation of car orders, one builder reports that his total was increased 5,000 during the months of January and February.

It has also been hinted that the steel casting plants have suffered in sympathy with the car works. On the contrary, most of the foundries specializing in railroad work have been operating at their capacity, and in the St. Louis district, where one-third of the country's output is produced, orders were recently placed for bolsters for 16,000 cars, which amounts to practically 23,000 tons of finished sections.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Carnegie Steel Co. Buys Pig Iron and Billets.—No Concession on Bars.

Office of THE IRON TRADE REVIEW, 521 PARK BUILDING, Mar. 6

The purchases of 5,000 tons of Bessemer pig iron and 10,000 tons of steel billets by the Carnegie Steel Co. are the only noteworthy developments of the week. The iron purchase is indicative of a continued shortage for steel works requirements, while the price paid for the material shows a decline of $1 a ton from the nominal quotation which has been prevailing for spot shipment. The steel, in the form of 4 x 4 billets, was secured from the New York State Steel Co., Buffalo, and will be shipped to consumers whose wants have been only inadequately met in the past few months. Notwithstanding the reports of postponed rail deliveries, local mills are operating at their capacity and the tonnage already booked by the leading interest for 1907 is within 80,000 tons of the total orders entered during the 12 months of last year. The tonnage booked during the week includes 5,000 tons of standard sections, and 6,000 tons of light rails. The announcement that the steel bar manufacturers have concluded to resist the demands of the implement makers for a concession is the most interesting development in finished lines. It will undoubtedly be met by a refusal to place contracts until the present ones have expired, and may be followed by continued purchases to cover only current wants.

Pig Iron.—The purchase of 5,000 tons of Bessemer iron by the Carnegie Steel Co. for March delivery at $22 valley furnace is the first noteworthy order that has been placed for this steel making grade in the past thirty days. The purchase price shows a decline of $1 a ton from the nominal quotation which has been prevailing, although it is only seven cents a ton above the February average, which was $21.93 as compared with $22.06 for January and $22.07 for December. Additional tonnage will be taken by the Carnegie Steel Co., provided a satisfactory price can be secured, as the iron output of its furnaces continues inadequate to the steel works requirements. The suspension of the enforcement of the advance in southern freight rates, which was scheduled for March 3, is interpreted as an entire withdrawal of the proposed increase in southern tariffs. The foundry iron market continues inactive and quotations are merely nominal. Northern No. 2 for prompt shipment is held at $25 valley furnace, and for the second quarter $23 to $23.50 is quoted. The demand for southern grades has been limited almost entirely to small lots for immediate shipment, and asking prices for the last half range from $18 to $18.50 for No. 2. Both northern and southern grades of forge are easier, the former being quoted $21.85 Pittsburg for nearby delivery and the latter at $22.50 Birmingham. That southern values have been well maintained is indicated by the average selling price for February of one of the largest agencies which amounted to $21.50 Birmingham for No. 2. The average naturally is low as compared with prompt quotations, but this is due to the distribution of the tonnage on low priced contracts. Northern basic continues scarce, 2,000 tons having been taken by a southern steel works at $22.50 valley, equivalent to $25.10 delivered eastern Pennsylvania. Second quarter quotations are revised as follows:

Bessemer Valley	$21.50 to 22.00
Bessemer, Pittsburg	22.35 to 22.85
No. 1 Foundry, Pittsburg	23.35 to 23.85
No. 2 Foundry, Pittsburg	23.85 to 24.35
Gray Forge, Pittsburg	21.35 to 21.85
Basic, Valley	22.00 to 22.25
Basic, Pittsburg	22.85 to 23.10

Ferro-Manganese.—The market is somewhat stronger than it has been for some time, which is undoubtedly due to decreased shipments from English makers, one furnace having been taken off this product, while the output of another will be unavailable in the near future. For spot shipment, in car lots, $75 Pittsburg is asked for 80 per cent, while future requirements can be covered at $70. Imported, 50 per cent ferro-silicon, is held at $110; 12 per cent domestic, $36; 11 per cent, $35; 10 per cent, $34.

Steel.—To more satisfactorily meet the requirements of its billet consumers, which have only been inadequately met by its mills on account of the steel shortage, the Carnegie Steel Co. has purchased 10,000 tons of 4 x 4 billets from the New York State Steel Co., Buffalo, for deliveries extending to July 1. This company has recently completed a steel plant, which contains two Talbot furnaces, having an estimated capacity of 500 tons daily. No sales of steel are being made by any of the producers as the needs of thein finishing mills are in excess of the steel work output. Sheet bars are quoted at $30 Valley, 4 x 4 billets and larger, either Bessemer or open-hearth, $29.50 to $30 Pittsburg.

Skelp.—Few of the mills are offering skelp for early shipment, as their output has already been sold well through the year. Quotations are unchanged as follows:

Bessemer, grooved, 1.80c to 1.85c; sheared, 1.75c to 1.80c; basic, grooved, 1.85c to 1.90c; sheared, 1.80c to 1.85c; iron skelp, sheared, 2.15c to 2.25c; grooved, 2c to 2.10c.

Muck Bar.—Mill offerings are exceedingly limited and quotations are nominal at $37.50 to $38 for all pig bars and $36.75 for mixed bars.

Plates.—The demands of car works are as insistent as at any time in the past six months and, although there has been some readjustment of the time of delivery of cars for a few roads that are retrenching, the consumption of plates shows no decline. For prompt shipment, eastern mills are securing premiums of $2 to $4 a ton, otherwise quotations are unchanged, as follows:

Tank plate ¼-inch thick, 6¼ to 100 inches, 1.70c f. o. b. mill Pittsburg. Light plate schedule, No. 10, 1.80c; Nos. 11-12, 1.85c; Nos. 13-14, 1.90c; Nos. 15-16, 2c. Extras on the regular plate schedule are as follows per 100 pounds: Boiler and flange steel plates 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than four inches in width at ends, narrowest end not being less than 30 inches, 0.10c; complete circles, 0.20c. Plates in width over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1.00c. Gages under ¼-inch to and including 3-16-inch plates on thin edges, 0.10c; under 3-16 to and including No. 8, 0.15c; under No. 8 and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—The demand for sheets for early delivery continues heavy and on carload lots premiums of $1 to $2 are being asked. Specifications on existing contracts are in excess of the daily output and the tonnage accumulation on mill order books is constantly increasing. Official quotations are unchanged as follows:

Black steel sheets, one pass, cold rolled; Nos. 11-12, 2.20c; Nos. 13-14,

2.25c; Nos. 15-16, 2.30c; Nos. 17-21, 2.35c; Nos. 22-24, 2.40c; Nos. 25-26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 29, 2.75c; No. 30, 2.85c; galvanized, Nos. 10-11, 2.65c; Nos. 12-14, 2.75c; Nos. 15-16, 2.85c; Nos. 17-21, 3.00c; Nos. 22-24, 3.15c; Nos. 25-26, 3.35c; No. 27, 3.55c; No. 28, 3.75c; No. 29, 4.00c; No. 30, 4.25c. Corrugated roofing, $1.85 per square for No. 28 painted, 2½-inch corrugation and $3.25 per square No. 28 galvanized, 2½-inch corrugation. Blue annealed sheets, No. 10 and heavier, 1.85c; Nos. 11-12, 1.90c; Nos. 13-14, 1.95c; Nos. 15-16, 2.05c.

Tin Plates.—New business is comparatively light, as most of the large consumers covered their first half requirements some time ago. Considerable business has already been placed for the third quarter at current prices, which are as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.90 f. o. b. mill, Pittsburg district. Terms, 30 days, less two per cent for cash in 10 days.

Rails and Track Material.—On March 1 the Carnegie Steel Co., had orders booked for 531,946 tons of standard section rails for shipment this year, of which 73,449 tons are for traction lines and 458,497 tons for steam roads. Although only two months of this year have elapsed, the tonnage is about 80,000 tons below the entire bookings of 1906, which reached a total of 611,675 tons, of which traction lines contributed 156,824 tons and steam roads 454,851 tons. The tonnage of electric roads, taken thus far, will be greatly increased during the spring and summer months when the weather is more favorable for extensions and improvements. In referring to the 1906 tonnage, it should be explained that the heavy rollings for the Illinois Steel Co., and rails manufactured for export, are not included in this total. Up to the present time, only two roads of prominence have postponed rail shipments, but this action has not interfered with the operations of the mills, as their orders have been brought forward for lines that are anxious for early deliveries. Sales of standard section rails aggregate 5,000 tons for the week and an order for 6,000 tons of light rails taken by the Carnegie Steel Co. undoubtedly marks the beginning of the spring activity in this trade. Quotations are unchanged as follows:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; 8-pound, $40; 12-pound, $36 to $37; 16-pound, $35 to $36; 20-pound, $34 to $35; 25 to 45-pound, $33 to $34; angle splice bars for standard sections, $1.65; spikes for forward deliveries, $2.50.

Hoops and Bands.—Specifications continue satisfactory, although new tonnage is exceedingly light, consumers having generally covered their requirements during the summer months of last year. Quotations are unchanged as follows:

Hoops in carload lots, 2c; in less than carload lots, 2.10c; bands, 1.60c base, half extras as per standard steel.

Merchant Bars.—At a meeting of the implement manufacturers held in Chicago last week, a committee was appointed for the purpose of conferring with the steel makers with a view of securing a concession on steel bars on tonnage for delivery from July 1 this year, to June 30, 1908. To satisfy the demands of these interests a concession of $2 a ton was granted in April of last year, and the market was held open for a period of two weeks on a basis of 1.40c, to enable them to place their tonnage with the mills. Other consumers not favored with this price, however, objected to the official 1.50c schedule, and for several months steadfastly refused to close for their future wants. For a considerable period the market remained unsettled, and but for the general strength of the situation this feature would have proved a disturbing factor of considerable moment. Although this committee has not as yet called on the bar manufacturers, its visits will undoubtedly be in vain, as it has been definitely decided that no concession will be made to any class of consumers regardless of their tonnage requirements, and from present indications the 1.60c basis will remain unchanged. We quote as follows:

Common iron bars, 1.80c Pittsburg in carload lots and over, 1.85c in less than carloads; Bessemer steel bars, 1.60c, net; plow and cultivator, 1.60c, net; channels, angles, zees, tees, under three inches, 1.70c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size 0.30c advance. Cold rolled and ground shafting, 50 per cent off in carload lots, and 5 per cent off in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flats, 1.60c to 1.65c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.10c to 2.15c. The price of planished and machine straightened tire is 1.80c, base, half tire extras. Iron finished tire up to 1½ inch and over to be sold on regular bar basis of 1.60c base, half extras, steel card.

Structural Material.—New tonnage continues light, although the outlook is bright for the placing of considerable business in the near future as local architects are designing several large office buildings, which will be erected during the spring and summer months. It is generally conceded, however, that this year's building activity throughout the country will not be as great as that experienced last year, when a new high record was established. Quotations are unchanged, as follows:

Beams and channels, 15-inch, and under, 1.70c; over 15 inches, 1.80c; zees, 1.70c; tees, 1.70c; angles from three to six inches inclusive, 1.70c; over six inches, 1.80c; universal and sheared plates, 6¼ inches and wider, 1.70c base.

Wire and Wire Nails.—Shipments for the spring trade are now going forward and the tonnage is being prorated that a more equitable distribution of material may be had. With few exceptions shippers' stocks are light, and specifications on contracts exceed the daily output of the mills. We quote as follows:

Wire nails, jobbers' carload lots, $2; retailers' carload lots, $2.05; less than carloads, $2.10; painted barb wire, $2.15, for jobbers in carloads; retailers in carloads, $2.20; and less than carloads, $2.30 with 30c for galvanizing; plain wire, $1.85 for jobbers and $1.90 by carload.

Merchant Pipe.—Orders continue in excess of shipments and the tonnage on the books of manufacturers is rapidly accumulating. As there was no lull in the pipe trade during the winter months, no opportunity was afforded the mills to accumulate stocks, and no material is on hand to meet the heavy spring requirements. Jobbers' floors throughout the country are barren and these distributors are now almost entirely dependent upon daily mill shipments. Discounts to consumers in car lots are as follows:

	Steel black	Steel galv.
⅛ to ¼ inch	66	50
⅜ inch	68	54
½ inch	70	56
¾ to 6 inches	74	64
7 to 12 inches	69	54
EXTRA STRONG PLAIN ENDS.		
⅛ to ⅜ inch	59	47
½ to 4 inches	66	54
4½ to 8 inches	62	50
Double extra strong plain ends, ⅜ to 8 inches	55	44

Boiler Tubes.—Sales have been limited since the recent advance as most of the large buyers covered their requirements before the increased prices became effective. We quote:

Boiler tubes.	Steel	Iron
1 to 1¼ inches	47	47
1½ to 2¼ inches	59	42
2½ inches	61	42
2¾ to 5 inches	65	52
26 to 13 inches	59	42

Less than carloads two points less.
2½ inches and smaller, over 18 feet, 10 per cent, net, extra.
3 inches and larger, over 22 feet, 10 per cent, net extra.

Coke.—The coke market is easier, slight concessions having been made during the week on both furnace and foundry grades. This condition is undoubtedly due to the increased shipments from the coke fields, the weather being

unusually favorable to the rapid movement of cars. For immediate shipment, furnace coke is quoted at $3.30 to $3.40, ovens, and for deliveries extending to July $3.15 to $3.25 is asked. Connellsville foundry coke for spot requirements is held at $3.60 to $3.75, and $3.50 could be done on contracts extending throughout the remainder of the year.

Old Material.—The recent decline in heavy melting stock has temporarily been checked by heavy purchases, estimated at 5,000 tons, made during the past few days by the Carnegie Steel Co. The material was acquired on a basis of $18, although dealers are now asking $18.50. A large open-hearth interest has also taken 2,000 tons of turnings at $16.50 and 1,500 tons of sheet scrap at $16.75. Eastern interests continue to scour this market for borings, which are scarce at $13. The embargo at Sharon on heavy melting steel has been lifted by the railroads although it still delays deliveries to the mills at Steubenville. Quotations on material for delivery in the Pittsburg district are revised as follows:

Heavy melting scrap, $18 to $18.50; re-rolling rolls, $20.50 to $21; bundled sheet scrap, $16.50 to $16.75; iron axles, $30.50 to $31; old iron rails, $23 to 23.50; No. 1 wrought scrap, $19.50 to $20; old car wheels, $24 to $24.50; low phosphorus scrap, $22.50 to $23; machine shop turnings, $15.50 to $16; axle turnings, $16 to $16.50; cast borings, $13 to $13.25; No. 1 cast scrap $20 to $20.50 .

CHICAGO.

Agricultural Implement Interests Will Ask Concession on Bars.—Pig Iron Erratic.

Office of THE IRON TRADE REVIEW, 1362 MONADNOCK BLOCK, Mar. 5

Representatives of the agricultural implement interests that last year secured a concession of $2 a ton from the prevailing price of steel bars by pooling their annual requirements, met in Chicago Wednesday, Feb. 27, and appointed a committee to wait upon the steel manufacturers for the purpose of learning what reduction can be secured on their total requirements for the year ending June 1, 1908. A reduction of $2 a ton, it is said, will again be sought, but strongly worded intimations have emanated from mill offices to the effect that no concession of any nature will be allowed this year. Most of the mills are comfortably filled with business for the last half, those in the west being tightly sold for the entire period, and no desire is felt by them at this time to book the 200,000 tons or thereabouts offered by the associated implement interests at less than the present price. A locking of horns for a few months is expected to follow, but it is felt in some quarters that a compromise of $1 a ton on shipments after Jan. 1 may result from the negotiations.

Pig iron continues in an erratic mood. Spot iron has been shaded 50 cents a ton in recent transactions, while for delivery in the second quarter sales of southern iron have been made on the basis of $21 Birmingham for No. 2 foundry, a reduction of $1 a ton from the former price. A freer offering of iron for the last half on the basis of $18 Birmingham is observed, but there is little or no trading going on for that delivery. Buying last week was active, but it was wholly confined to first and second quarter requirements. The proposed 25-cent advance in the southern freight rate has been postponed for another month, and it is felt that it will never become effective. The local situation on crude steel is easier and prices are inclined to slightly lower levels.

Pig Iron.—Increased weakness has developed in southern iron. The susceptibility that exists as to the future course of the market, coupled with the strong competition for spot business, has resulted in some irregularity on iron for early shipment. Only car lots en route or on track bring the top price of the market, which is $23 Birmingham; orders for March and April delivery can be placed at $22 Birmingham. For shipments extending a few weeks beyond the latter month, a large tonnage has been placed in the past week at $21 Birmingham, while in the case of "re-sale" iron, several lots for the same delivery have sold as low as $20.50 Birmingham for No. 2 foundry. Interest in the last half is of an apathetic nature. Eighteen-dollar iron for that delivery is increasing in quantity, but even this price will not now tempt desirable tonnage. No change has been made in the schedules of the two leading Birmingham producers for this delivery, the Tennessee company holding at $18.50 for No. 2 and the Sloss company at $19. The movement of iron from the south is very slow, and the railroads operating below the Ohio river have again postponed for one month the proposed advance of 25 cents a ton in the freight rate. Northern irons remain firm at a minimum of $23.50 Chicago for the last half, and at $27 to $27.50 for spot shipment. There is a good inquiry for charcoal, but only late deliveries can be secured. Quotations below are for the last half, those for southern irons being on the basis of a $4.10 freight rate:

Lake Superior charcoal	$25.50 to 26.50
Northern Foundry No. 1	24.00 to 24.50
Northern Foundry No. 2	23.50 to 24.00
Northern Foundry No. 3	23.00 to 23.50
Northern Scotch Foundry	24.00 to 24.50
Ohio Strong Softeners No. 1	23.30 to 23.80
Ohio Strong Softeners No. 2	22.80 to 23.30
Southern Foundry No. 1	22.60 to 23.10
Southern Foundry No. 2	22.10 to 22.60
Southern Foundry No. 3	21.60 to 22.10
Southern Foundry No. 4	21.10 to 21.60
Southern No. 1 Soft	22.60 to 23.10
Southern No. 2 Soft	22.10 to 22.60
Southern Gray Forge	19.60 to 21.10
Southern Mottled	19.10 to 19.60
Southern Silveries 4 per cent to 6 per cent Silicon	24.60 to 25.10
Jackson Co. Silveries, 8 to 10 per cent Silicon	30.30 to 32.30
Malleable Bessemer	23.50 to 24.00

Billets and Rods.—The increase in the number of quotations on current inquiries for crude steel suggests an easier feeling in this product. No transactions of importance have been effected, nor are prices any different. Forging billets are firm at a spread of $36 to $38 Chicago, according to tonnage and delivery, and wire rods are held at a minimum of $36 Pittsburg, for Bessemer. Open-hearth rods are almost unobtainable.

Iron and Steel Bars.—The possibilities of a deadlock between mills and agricultural implement manufacturers on the purchase of steel bar requirements, for the year commencing with July 1, next, are very sure. At a meeting in Chicago last week, the implement interests that last year were favored with a $2 concession from the established price, appointed a committee to interview the steel producers with a view to securing a concession on the coming year's business. Beyond this, no further steps have been taken, but it is stated by mills in words which leave no shadow of a doubt as to their position in the matter, that there will be no concessions granted this year. One independent producer has even advanced its price on steel bars $2 a ton, or to the basis of 1.70c Pittsburg. Specifications on current contracts continue exceedingly heavy, and deliveries are slow and far behind. Some new tonnage has been placed this week, one mill securing a contract for 1,000 tons at 1.60c Pittsburg. Bar iron is firm and active at a minimum of 1.65c Pittsburg. Prices as quoted last week are unchanged.

Plates.—Ship builders, car builders and railroads continue to specify heavy wants. Deliveries are slow, especially of universal sizes. On sheared plates, the Illinois Steel Co. has specifications in hand sufficient to operate its plant up to August next. Prompt shipments can be obtained from independent producers without difficulty at a premium of $2 a ton. Jobbers report an active movement from stocks. Prices are without change as follows:

Plates ¼ inch and thicker 6⅛ to 100 inches wide, either universal or sheared, 1.70c Pittsburg base. For extras, see Pittsburg report. Freight rate to Chicago, 16½c per 100 pounds. Jobbers' prices for shipment from local stocks

are as follows: Tank steel ¼ inch and heavier up to 72 inches wide, 2.20c; 3-16 inch up to and including 60 inches wide, 2.30c; 3-16 inch 72 inches wide, 2.55c; No. 8 up to 60 inches wide, 2.35c. Flange steel, 25c extra; heads, 25c extra.

Sheets.—The recent advances in spelter have greatly strengthened galvanized sheets, and an advance of $1 or $2 a ton in these is daily expected. Black sheets are also firmer, and the lighter gages are expected to share in the next advance. Both new tonnage and specifications continue heavy; deliveries are extremely slow. Local jobbers are loud in complaint against delayed shipments, the movement from their warehouses being 50 per cent in excess of deliveries from mills. We continue to quote carload lots as follows:

Black sheets Nos. 8, 9 and 10, 1.90c Pittsburg; No. 28 gage, 2.60c Pittsburg. Galvanized sheets No. 28 gage 3.75c Pittsburg. Freight to Chicago 16½c per 100 pounds. Jobbers' prices on less than carload lots from store are as follows: No. 10, 2.25c to 2.30c; No. 12, 2.30c to 2.35c; No. 14, 2.35c to 2.40c; No. 16, 2.45c to 2.50c; Nos. 18-20, 2.70c to 2.80c; Nos. 22-24, 2.75c to 2.85c; No 26, 2.80c to 2.90c; No. 27, 2.85c to 2.95c; No. 28, 2.95c to 3.05c; No. 30, 3.35c. Galvanized sheets, Nos. 10 to 20, 3.40c to 3.45c; Nos. 22 and 24, 3.55c to 3.60c; No. 26, 3.75c to 3.80c; No. 27, 3.95c to 4c; No. 28, 4.15c to 4.20c; No. 30, 5.35c to 5.40c.

Structural Steel.—Contracts have been made by the Lake Shore, Pennsylvania, Baltimore & Ohio and Lake Shore & Eastern railroads with the Strobel Bridge Co., of Chicago, for five bascule bridges to be erected over the canal at Indiana Harbor, Ind. The steel has not yet been let, although the bridges are to be completed by Sept. 1. The "Soo" line has also let a contract to the Minneapolis Steel & Machinery Co., for several thousand tons of fabricated bridge material. Specifications are out for two local buildings, one known as the Lehman building, 1,800 tons, and the Spaulding and Merrick building, 3,500 tons. Specifications for structural shapes on local mills are increasing. Prices are without change, as follows:

Beams and channels, 3 to 15 inches inclusive, 1.70c Pittsburg. For extras see Pittsburg report. Freight rate from that city to Chicago is 16½c per 100 pounds. Quotations from store are as follows:

All angles, three inches and larger, including six inches, $2.05 to $2.10 per 100 pounds; angles over six inches, $2.15 per 100 pounds base, beams, three inches to 15 inches, inclusive, $2.05 to $2.10 per 100 pounds base; channels, three inches and larger, $2.05 per 100 pounds base. Less than carload lots are $1 a ton higher than foregoing prices.

Rails and Track Supplies.—The largest inquiry for standard sections this week is for 15,000 tons. This is from a western steam road which desires delivery this year. A few small traction orders have been placed, but the aggregate tonnage is not of great proportions. Light rails are in good demand, the best delivery obtainable from local makers being four months from date. Track supplies are also moving freely. We quote as follows:

Bessemer rails, $28 to $30; less than 500-ton lots, $32; open-hearth rails $29; light rails, Bessemer, 30 to 45-pound sections, $35, 25-pound, $36; 20-pound, $37; 16-pound, $38, 12-pound, $39, and lighter sections down to 8-pound, $45.50, all f. o. b. mill. Track supplies vary in price according to quantity and delivery. Angle bars in large lots are quoted 1.65c to 1.75c; for smaller quantities, 2.25c to 2.75c; spikes, large lots, 2.30c, for smaller quantities, 2.50c; bolts, large lots, 2.65c to 2.75c; smaller lots, 2.85c with square nuts, and 3c with hexagon nuts.

Merchant Steel.—Specifications are interesting because of their great volume. No diminution is noted, and mills are slow in overcoming the congestion. New tonnage is light because of the tightly sold condition of makers of these products. Prices are as follows:

Planished or smooth finished tire steel, 1.96½c; iron finish, up to 1½ x ½ inch, 1.91½c base; iron finish, 1½ x ½ inch and larger, 1.76½c base; channels for solid rubber tires, ¾ to 1 inch, 2.26½c, and 1⅛ inch and larger 2.16½c; smooth finished machinery steel, 2.16½c; flat sleigh shoe, 1.81½c; concave and convex sleigh shoe, 2.06½c; cutter shoe, 2.35c; toe calk steel, 2.31½c; railway spring, 1.96½c; crucible tool steel, 6½c to 8c, with higher prices asked on special grades. Shafting is very strong. Quotations are without change at 50 per cent off in car lots and 45 per cent in less than car lots, in base territory.

Cast Iron Pipe.—The only contract of importance let in the week under review was that of the city of Milwaukee for 1,500 tons. This went to the United States Cast Iron Pipe & Foundry Co. The same interest also secured an order for 600 tons from the city of Springfield, O. Prices for Chicago delivery are firm as follows: Four-inch water pipe, $38.60; six to 12-inch inclusive, $37.60; 16-inch and upward, $1 a ton less; gas pipe $1 a ton higher.

Merchant Pipe.—No cessation is noted in the inquiry for pipe. Deliveries are slow, especially on mixed car lots. Prices are firm as follows: ¾ to six inches black steel pipe, 74.35 per cent discount; galvanized 64.35 per cent discount. From store in small lots, Chicago distributors are asking 72½ per cent discount on the base sizes.

Boiler Tubes.—Demand for tubes is good. Shipments are slow and consumers and distributors are greatly inconvenienced by the shortage. Prices are without change as follows: 2¾ to five inches, steel, $63.35 Chicago; iron, $50.35; seamless, $50.35. On less than carload lots from store, we quote 60 off for steel; 47½ for iron and 47½ for seamless.

Wire Products.—The increased cost and shortage of spelter has resulted in a strengthening of all galvanized wire products. Deliveries on these are slow because of the compulsory curtailment of output by reason of the shortage of galvanizing materials and the small margin of profit allowed manufacturers on the basis of present prices. There is no diminution in demand, but deliveries continue slow owing to the congestion on mill books and the shortage of raw material. We quote prices to jobbers, Chicago delivery, as follows:

Wire nails, $2.15; painted barb wire, $2.30; galvanized barbed wire, $2.60; smooth annealed wire, $2.30; polished staples, $2.55. Carload lots to retailers, five cents higher; less than carload lots, 15 cents higher.

Old Material.—Cast scrap was in active demand this week, and under the numerous transactions quotations on this product advanced from $17.50 to $20. The market rests at the latter figure and is extremely strong on that basis. Car wheels are stationary, a few small lots having been moved at $23 Chicago. Heavy melting steel is in good demand, one foundry being in the market for 1,000 tons of billet crop ends. Mill scrap is without change. No demand is felt and prices are inclined to weakness. We quote as follows, gross tons in the first paragraph:

Old Steel Rails (3 feet and over)	$19.00 to 19.50
Old Steel Rails (less than 3 feet)	18.00 to 18.50
Old Car Wheels	23.00 to 23.50
Old Iron Rails	25.00 to 26.00
Light Section Relayers, 45 lbs. and under, subject to inspection	20.00 to 22.00
Relaying Rails, subject to inspection	31.00 to 32.00
Frogs, Switches and Guards	16.50 to 17.00
Heavy Melting Steel	16.00 to 16.50
Mixed Country Steel	12.50 to 13.00

We quote net tons as follows:

No. 1 R. R. Wrought	$15.25 to 15.75
No. 2 R. R. Wrought	14.25 to 14.50
Shafting	17.00 to 17.50
Dealers Forge No. 1	12.00 to 12.50
Wrought Pipe and Flues	12.00 to 12.50
No. 1 Cast, 150 pounds and less	20.00 to 21.00
No. 1 Mill	10.50 to 11.00
Mixed Busheling (No. 1 & No. 2)	11.00 to 11.50
Country Sheet	8.50 to 9.00
No. 1 Boilers Cut	11.50 to 12.00
Boiler Punchings	15.00 to 15.50
Iron Car Axles	26.50 to 27.00
Steel Car Axles	21.00 to 21.50
Iron Axle Turnings	11.00 to 11.50
Cast Borings	8.50 to 9.00
Mixed Borings, etc.	8.50 to 9.50
Machine Shop Turnings	11.00 to 11.50
Railroad Malleable	16.00 to 16.00
Agricultural Malleable	15.00 to 15.50
Stove Plate and Light Cast Scrap	14.50 to 15.50
Old Iron Splice Bars	20.00 to 21.00

Coke.—Activity in coke is confined largely to spot deliveries. Connellsville 72-hour brands for delivery prior to July 1 are quoted $3.75 to $3.85 ovens, and for shipment during the remainder of

the year, $3.65 to $3.75 ovens. By-product coke for spot shipment is firm at $6.90 to $7.15 Chicago.

CLEVELAND.

Making Concessions on Steel Bars Discussed.—Pig Iron Firm.

Office of THE IRON TRADE REVIEW, Browning Building, Mar. 5

Pig Iron.—While the inquiry has not been strong during the week, and sales not numerous, the market is firm, and there is no indication that lower prices of foundry grades will prevail. Some concession may be made on steel-making irons, but there is no immediate prospect of that being done. One large local interest which makes both foundry and steel making irons has sold up to the first of November, and while other interests are not so well fixed, there is no anxiety concerning the future. We quote f. o. b. Cleveland for half last delivery as follows:

Bessemer	$21.00 to 21.50
No. 1 Foundry	22.50
No. 2 Foundry	22.00
No. 3 Foundry	21.50
No. 2 Southern	22.00
Gray Forge	20.00 to 20.50

Coke.—On account of a number of blast furnaces being blown out, the market for furnace coke is not so strong. Foundry coke is in good demand at recent quotations. We quote strictly Connellsville furnace coke at $3.40 to $3.50, and foundry coke $3.85 at the ovens.

Finished Material.—The mills are simply overwhelmed with orders and are falling farther behind in deliveries on all materials, except possibly structural shapes, so that now promises for delivery are seldom given short of six or eight months. On sheets the usual delivery is from 20 to 24 weeks. The principal subject now under consideration is as to what price will be made to the agricultural interests on steel bars when the new contracts are made. A year ago, when the price of steel bars was 1.50c, contracts were made with the agricultural interests at 1.40c, and some of them are now asking that the same price be made, but all would doubtless be well pleased if they could buy at 1.50c, which would be $2.00 below the present market price. There is, however, much opposition to making any concession this year, principally on the ground that when the conditions are as strong as they are today, there is no reason that concessions should be made to any one, and that the agricultural interests are no more entitled to special consideration than are other large buyers. It is also charged that last year, in a few cases, implement concerns which paid 1.40c for bars, contracted for more than their own requirements and then resold part of the tonnage. Another factor which does not tend to put the manufacturers in a mood for granting special favors is the fact that some of the implement concerns, in a petition to President Roosevelt, which vigorously attacked the so-called "trust," asked to have the duty on steel removed or reduced.

Old Material.—The market remains in about the same condition as last week. Turnings and borings continue strong, but in other grades prices remain unchanged. Predictions are freely made that further declines in the market will be noted within the next month or two. It has been some time since the mills have been in this market, and it is believed that they cannot postpone their buying much longer. The Pennsylvania and Santa Fe railroads have listed tonnages with dealers, the former for 5,000 tons and the latter for 2,500 tons. Our revised quotations, f. o. b. Cleveland, gross tons, are as follows:

Old iron rails	$25.00 to 26.00
Old steel rails (re-rolling)	18.50 to 19.50
Old steel rails (under 6 feet)	18.50 to 19.50
Old car wheels	21.50 to 22.00
Steel boiler plate	13.50 to 14.00
Steel axles	21.50 to 22.50
Malleable iron (railroad)	18.50 to 19.00
Malleable iron (agricultural)	15.50 to 16.00
Heavy steel	17.00 to 17.50
Country mixed steel	14.50 to 15.50
Low Phosphorus	23.00 to 24.00

We quote net tons as follows:

No. 1 R. R. wrought	$17.00 to 18.00
No. 1 busheling	14.50 to 15.00
No. 1 machine cast	18.00 to 18.50
Iron axles	25.50 to 26.00
Axle turnings	13.50 to 14.00
Wrought turnings (free from cast)	13.00 to 13.50
Grate bars	14.00 to 15.00
Pipes and flues	13.50 to 14.00
Tank iron	12.00 to 13.00
Hoop and band iron	8.50 to 9.00
Sheet iron	7.50 to 8.50
Wrought drillings	13.00 to 13.50
Stove plate	14.00 to 15.00
Cast borings	10.50 to 11.00

CINCINNATI.

Southern Furnaces Make Large Sales.—Ironton Furnaces Well Sold Up.

March 5.

Pig Iron.—The general inquiry has been light the past week, but several large transactions have been closed and in point of tonnage sold, there has been a very heavy business. One of the matters closed involves what is regarded as much of the iron that was available in the south for second quarter delivery, but the details of these sales were not made public. A report comes from the south that furnaces in the Birmingham district have sold a tonnage aggregating 75,000 tons in scattering sales through various agencies, some for southern consumption, but most of it going north, with no iron for the last half contracted at less than $18.50 Birmingham.

There have been some good sales of malleable Bessemer through Cincinnati agencies which came from valley furnaces on the basis of $22.00 to $22.50 at furnace, for early delivery.

These tonnages went to large consumers quietly and on private terms for the most part. The rank and file of consumers are not showing much interest in the market for the last half. It seems that $18.50 Birmingham for last half is now more firmly established than for several weeks. The market, while quiet in a general way, has an undertone of strength. There has been no improvement in the movement of iron from the south and the advance in freight rates has been postponed for another 30 days.

Spot iron is unchanged and sales continue to be made on the basis of $23.00 Birmingham for iron that is loaded and in transit. We quote spot iron delivered Cincinnati as a basis for settling contracts based on our quotations as follows:

Southern foundry No. 1	$26.50
Southern foundry No. 2	26.00
Southern foundry No. 3	25.00
Southern foundry No. 4	23.50
Southern foundry, No 1 soft	26.50
Southern foundry, No. 2 soft	26.00
Gray forge	$21.50 to 22.00
Northern foundry No. 1	26.65 to 27.75
Northern foundry No. 2	26.15 to 27.15
Northern foundry No. 3	25.65 to 26.65
Jackson County silvery, 8 per cent	31.15

One of the large southern producers advises its sales agencies that it will not be able to take any orders for deliveries prior to October. In the Ironton district the furnaces are well sold up through the first half. This week's information is to the effect that this is also the condition of the producers in the south to a larger extra than a week ago. We quote for last half delivery, delivered Cincinnati, as follows:

Southern Foundry No. 1	$22.00 to 22.50
Southern Foundry No. 2	21.50 to 22.00
Southern Foundry No. 3	21.00 to 21.50
Southern Foundry No. 4	20.50 to 21.00
Southern Foundry No. 1, soft	22.00 to 22.50
Southern Foundry No. 2, soft	21.50 to 22.00
Gray Forge	19.50 to 20.50
Northern Foundry No. 1	22.65 to 23.15
Northern Foundry No. 2	22.15 to 22.65
Northern Foundry No. 3	21.65 to 22.15
Jackson County Silvery, 8 per cent	30.15 to 31.15

Coke.—The market is quiet and steady. There is not much contracting and business is confined to a fair run of inquiries for prompt shipment coke. Prices in the leading coke producing districts are as follows:

Wise County, Va. Furnace Coke prompt shipment	$3.25 to 3.50 per ton
Wise County, Va. Foundry Coke	4.00 to 4.25 per ton
Pocahontas Furnace Coke prompt shipment	3.25 to 3.50 per ton
Pocahontas Foundry Coke	3.50 to 4.00 per ton
Connellsville Furnace Coke prompt shipment	3.25 to 3.60 per ton
Connellsville Foundry Coke	4.00 to 4.25 per ton
New River Foundry Coke on contracts	3.75 to 4.00 per ton
New River Furnace Coke, prompt shipment	2.75 to 3.00 per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.70 to $1.75 per ton on $9.00 pig iron, plus 19 to 20 per cent of the advance on pig iron above $9.00 Birmingham.

Finished Material.—The demand is good for small lots. There is not much doing in the way of contracting for forward delivery, but specifications on contracts are good. Retail orders are filled here at the following quotations:

Rivets, 3.15c base; cold rolled shafting, 45 per cent off list; steel tire, 2.10c base.

Old Material.—The market is steady and unchanged. There is only a moderate demand, but prices are well maintained. We quote f. o. b. Cincinnati as follows:

Old No.1 railroad wrought, net tons	$17.50 to 18.50
Cast machine and foundry, net tons	18.50 to 19.00
Old iron rails, gross tons	25.50 to 26.50
Old steel rails, gross tons	19.00 to 20.00
Old short lengths, gross tons	18.00 to 19.00
Old iron axles, net tons	26.00 to 26.50
Heavy melting scrap, gross ton	20.00 to 21.00
Stove plate, net tons	14.50 to 15.00
Wrought turnings, net tons	12.50 to 13.00
Cast borings, net tons	9.50 to 10.00
Car wheels, gross tons	21.50 to 22.00

PHILADELPHIA.

Talk of Lower Prices Stops—Interest In Second Quarter Iron.

March 5.

Pig Iron.—Interest in the market centers principally in second quarter iron, for which there has been a very urgent demand during the past week. The near approach of this period has confirmed the statements frequently made that many consumers, both large and small, have not covered their requirements for it, and they are now seeking to place orders in such numbers as to give great strength to the market, not only for the second quarter, but for the third as well. Talk of declining prices has disappeared, and from present indications the high quotations which have prevailed for prompt shipments throughout the winter will continue until summer and in all probability tend to bring third and fourth quarter prices up toward their own level. Many furnaces have been working badly, and in this territory one old standby, the Nittany, which has been running continuously for five years, with a production of about 4,000 tons a month, has been compelled to blow out for at least two months of idleness. At least one large industrial plant has been forced to shut down temporarily for lack of iron, and many small establishments find themselves in straits. An instance is reported where a small foundry found itself without any pig iron because a delivery made to it proved unfit. In this emergency the only iron it could obtain was from another establishment, for which it was obliged to pay $30 for No. 1X. Such a case is no doubt extreme, but it serves to illustrate the prevailing scarcity of spot iron. Four cargoes of English iron have arrived here within a week, but nearly all has been sold ahead, and the amount imported, from 15,000 to 20,000 tons, seems not to have made the smallest impression on prices. No. 2X foundry for the first half brings from $25.50 to $25.75, standard gray forge, $23.50 and basic $24.50 to $25. For the last half, in which increasing interest is shown as it steadily draws nearer, prices are held firmly at about the following quotations, which show no change:

No. IX Foundry	$25.75 to 26.25
No. 2X Foundry	23.50 to 24.25
No. 2 Plain	23.00 to 23.50
Standard Gray Forge	22.00 to 22.50
Basic	23.25 to 23.75
Low Phosphorus	27.00 to 27.50

New Material.—There is a steadily improving demand for structural material as the season for active building and bridge work approaches, and plates are also in greater demand. The activity in all finished lines is so general that it is not necessary to particularize. Prices rule firm at the figures which have stood for some time past, as follows:

Beams, channels and angles, according to specifications, 1.83½c to 2c; refined iron bars, 1.89½c to 1.93½c; steel bars, 1.83½c to 1.88½c; plates, 2.13½c to 2.18½c.

Old Material.—Steel scrap continues in demand, with a slight rise in price. In other lines there is no noticeable change, and the market is quiet, as it has been for several weeks past. In view of the general activity of the mills dealers decline to make concessions, believing that the mills will have to come to their figures. Prices may be quoted as follows:

Old steel rails	$19.50 to 20.00
No. 1 steel scrap	18.75 to 19.25
Old steel axles	22.00 to 22.50
Old iron axles	30.00 to 31.00
Old iron rails	26.50 to 27.00
Old car wheels	23.00 to 24.00
Choice scrap, R. R. No. 1 wrought	20.75 to 21.25
No. 1 yard scrap	18.75 to 19.25
Machinery scrap	22.50 to 23.00
Low phosphorus scrap	22.50 to 23.00
Wrought iron pipe	16.50 to 17.00
No. 1 forge fire scrap	17.00 to 17.50
No 2 forge fire scrap, ordinary	11.50 to 12.00
Wrought turnings	16.75 to 17.25
Axle turnings, heavy	17.25 to 17.75
Cast borings	14.50 to 15.00
Stove Plates	17.00 to 17.50

NEW YORK.

Urgent Demand for Delivery of Iron. —Improvement in Structural Shapes.

Office of THE IRON TRADE REVIEW. }
ROOM 1315, No. 150 NASSAU ST., MAR. 5 }

Pig Iron.—The bulk of current business is for delivery during the remainder of the first half. A large number of melters, it appears, have found themselves running short of iron to such an extent, in some instances, that recent purchases specified delivery within two days. Others have resorted to attempts at securing anticipations on second quarter contracts, and the net result has been a very perceptible quickening of nearby business. Sales have been small, but the aggregate tonnage is considerable. For delivery ahead of July 1 the market continues extremely quiet. Bearish reports have been widely circulated during the past month, and, though failing utterly of realization, have served to make consumers very backward. While they are waiting, the market is evidently growing stronger. Prices are firm and furnace interests are unwilling to talk concessions. It is stated that the New England district is in remarkably good shape to play the waiting game. In that section a great many foundries are operated in connection with manufacturing plants and no part of their output goes on the market. Experience has dictated a cetrain mixture of irons as best suited for producing the particular sort of castings sought, and to make sure of securing these irons, orders are always booked early. For this reason the majority of New England melters have covered a part of their last half requirements and hence are able to await future developments without much anxiety. The southern situation is increasingly strong from the producer's standpoint, and a quotation of $18.50 on No. 2 foundry for last half or last quarter delivery has become a rarity. On the most common grades southern furnaces are booked well through the first half, with a good proportion of their last half make taken. This, coupled with the long-existing transportation difficulties which have gotten some furnaces badly in arrears on shipments, have forced certain interests out of the market. One instance is noted where inadequate car service compelled the blowing out of a furnace which could not secure its raw materials. It is announced that the advance in freight rates from southern furnaces to points north of the Ohio has been postponed again and that in case ample relief is not afforded by the time now set for its taking effect, April 1, a further delay will probably be granted. Local selling interests report the volume of February business as only fairly heavy. The opening days of March saw a sharp improvement in practically all grades of irons. Tidewater prices for second half delivery follow:

Northern Foundry No. 1	$24.00 to 25.00
No. 2 Foundry	23.50 to 24.50
No. 2 Plain	23.00 to 24.00
No. 1 Southern Foundry	22.50 to 23.00
No. 2 Southern Foundry	22.00 to 23.00
No. 3 Southern Foundry	21.50 to 22.00
No. 4 Southern Foundry	21.00 to 22.00

Finished Material.—The improved demand for structural material, noted a week ago, has become more pronounced and the first week in March has been thoroughly encouraging to fabricating and erecting concerns. It is estimated that in this district some-

thing like 100,000 tons of structural work is pending, and the greater part of it will be let during the current month. This includes about 6,500 tons of materials for the Great Northern railroad, which will probably be closed during the week. The American Bridge Co., during February booked slightly more than 50,000 tons of materials. In addition to the 6,000 tons required for the Waverly warehouse of the Corporation, closed late in last month, several constituent companies have taken various small amounts aggregating about 1,500 tons. The St. Louis & San Francisco R. R. has contracted for 2,500 tons and the B. & O. R. R. for 600 tons. For the Queen's approach to the Blackwell's Island bridge, New York, the leading interest is to furnish about 8,300 tons. Various independent concerns have booked good orders of late, among them the Pennsylvania Steel Co., and the Riter-Conley Mfg. Co. The frequent reports of cancellations of orders by railroad interests ostensibly because of lack of money, are given little credence. Structural contracts do not permit cancellations and none is reported. It is admitted that there has been some curtailment in the way of cutting down extensive projects not entirely necessary, but this has been done before the work reached the bidders. This condition has existed for some time and has received due consideration. In spite of it, however, the leading interest finds its shops badly crowded and can see no relief until well in the fall. Some good tonnages of cast iron pipe are pending. There is considerable activity in plates, with one good sized order to be placed shortly. Billets are selling actively in the local market at about $31.50.

Old Material.—The local market continues active, with prices firm, though certain lines are more or less erratic. We quote tidewater prices, gross tons, as follows:

Old iron rails	$24 00 to 25.00
Old steel rails, long lengths	19.50 to 20.00
Old steel rails, short pieces	16.50 to 17.00
Relaying rails	28.00 to 29.00
Old car wheels	21.50 to 22.00
Old iron car axles	28.50 to 29.50
Old steel car axles	21.00 to 21.50
Heavy melting steel scrap	16.25 to 16.75
No. 1 railroad wrought scrap	20.00 to 20.50
Iron track scrap	17.50 to 18.00
Wrought pipe	14.50 to 15.00
Cast borings	11.50 to 12.00
Wrought turnings	14.50 to 15.00
Heavy Cast Scrap	18.50 to 19.00
Railroad Malleable	18.00 to 18.50
Agricultural Malleable	16.00 to 17.00
Stove Plate	16.50 to 17.00

BUFFALO.

Demand for Prompt Iron Urgent.—Prices are Firm.

March 4.

Pig Iron.—The condition of the iron market continues firm without change in prices. The demand for iron for early delivery is urgent, but no tonnage is available. Very little buying is reported for the week past and the third quarter iron of most of the furnaces is practically taken up. All the sales of the past week were for last quarter delivery and while there is still considerable fourth quarter iron not sold, it is not being contracted for very fast, the strong demand being noticed chiefly for spot delivery or for the earliest possible delivery on contracts previously made, in which case a higher price than the market was offered to secure the earlier deliveries. The furnaces here have not been in shape to accept such propositions, but they have made every effort to meet the demands of their customers.

Conditions brought about by the shortage of cars are about the same as they were last week, except that some shipments which had been loaded on cars, which railroads could not move have been forwarded, but these places were filled with the output of the furnaces during the week. The furnace managers have been in almost constant communication with the railroads with regard to hurrying shipments, but little headway has been made. A few sales have been reported for Scotch iron for prompt delivery and the same is true of southern. We quote for last half delivery as follows:

No. 1 X Foundry	$22.75 to 23.25
No. 2 X Foundry	22.25 to 22.75
No. 3 Foundry	21.50 to 22.00
No. 2 Plain	22.00 to 22.50
Malleable Bessemer	22.50 to 23.00
Gray Forge	21.50 to 22.00
Charcoal	26.00 to 27.60

BRITISH MARKET.

Pig Iron Prices Vacillate.—Effect of American Reports.

Office of THE IRON TRADE REVIEW.
Prince's Chambers, Corporation St.,
Birmingham, Feb. 23.

The pig iron market is again in a state of vacillation, and even the best informed hardly know what a day will bring forth. There was a drop in Cleveland warrants yesterday of 9d per ton, which brought the rate to £2 15s 5d ($13.56.) There was a very similar experience at the end of the week, warrants having a decided slump and losing practically all the 1s 7d gained during the first two or three days of the week. In every case it would seem that American reports are responsible for the fall in prices. Makers are holding off the market, and the only business done is by merchants. Shipments for the time being are smaller, but there is still a good trans-Atlantic trade. Connal's stocks continue to reduce, the latest report being that the amount in store was 496,616 tons. The fall in pig iron will be a source of great satisfaction to the Midland ironmaster, who states that his pig iron prices have increased by 16 shillings per ton, while the increase in selling price of finished iron has only been 2 shillings per ton. The following are today's quotations of pig iron: Cleveland warrants £2 15s 5d ($13.56); No. 3, £, 16s 3d ($13.76); No. 4 Foundry, £2, 15s ($13.46); No. 4, Forge, £2 15s, Hematite iron is maintained at £3 19s ($19.74) mixed numbers. The high rates of coke and ore are causing very great concern. The stock of hematite, West Coast, is now 75,995 tons. Fortunately for smelters, they are not needing orders, and this circumstance prevents what might otherwise be a debacle in pig iron.

BIRMINGHAM, ALA.

Proposed Advance in Freight Rates Again Postponed.—Market Strong.

March 4.

With a strong inquiry for pig iron, a steady sale being noted and another postponement of time for the advance in freight rates to take effect, the Alabama pig iron manufacturers are in a good mood. The inquiry for iron is strong, indicating that there will be need for a large quantity yet this year. Quotations are firm, no iron being sold here as far as can be heard of under $18.50 per ton No. 2 foundry, for the last half. The rumors of a break in the market are not regarded seriously by the Alabama manufacturers. Sales made recently provide for a good proportion of the make up to October of this year. A few sales were recorded during the past week for iron to be delivered during the last quarter of the year. A large inquiry has been received recently in this district from cast iron pipe manufacturers. The statement was given out during the past week that inquiries had been received in one office for 80,000 tons of pig iron, delivery during the last half of the year and the prediction was made that more than one-fourth of this would result in the business being placed. Conditions were never more favorable. As far as can be learned, no furnaces will be blown in in this district until the latter part of this month.

The railroads in the southern territory have given notice of the postponement of the advance in freight rates for thirty days. With 90,000 tons of pig iron and cast iron pipe on the yards in this territory, delayed since November and longer, the postponement means something. The advance of 25 cents per ton on iron and kindred products from the southern territory to the Ohio river may never be put into effect. The transportation companies are making efforts to improve the

conditions. The Southern railway has placed a car distributor in this district. The Central of Georgia railroad has named a train master for this district, the only representative of the operating department here. The Frisco announces the order of many box cars, coal cars and coke racks, delivery on the same to be in evidence during the middle of this month. The Louisville & Nashville railroad announces the order of a number of locomotives, two of which have been delivered to this division. The Alabama Great Southern railroad is bettering the road and putting on more equipment. The Seaboard and other roads are improving the service.

METAL MARKET.

CHICAGO.

March 4.

No change was apparent in the metal market this week. The high prices show no signs of abatement and although there has been no increase there are indications that prices may advance higher. The demand continues great. Copper sold for 26¾c for casting and 27c for lake. Pig tin varies from 44½c and 45c depending on the quantity bought. For sheet zinc the price is 8.50c La Salle in car lots of 600-pound casks. Spelter is quoted at 6.90c. Lead desilverized varies from 6.50c and 6.60c for fifty-ton lots and corroding at 7.25c to 7.35c. Car load lots ran about 2½c per 100 pounds higher. Cookson's antimony 28½c; other grades 26½c.

NEW YORK.

March 5.

Copper.—Engineering reports of the probable output of copper at western producing points indicate that the tonnage to be shipped during March and April may be as much as one-third less than that shipped during the corresponding months last year. The present demand is good and considerable sales are announced. Electrolytic is quoted at 25¼c to 25¾c, with an active demand for prompt delivery. Lake copper is held at 25¼c to 26c, according to date of shipment. Imports since the first of the year are estimated at about 7,000 tons. For the year so far imports at Atlantic ports have been about 26,000 tons. The best selections of English copper closed yesterday at London at £116.

Pig Tin.—A moderate demand is noted in the local market, with spot sales in small lots at 42.30c to 42.50c. The British market opened the week strong and spot shipment closed in London Monday at £194 10s. Since the first of the month over 800 tons has arrived, and more than 3,000 tons is now afloat.

Pig Lead.—A fair demand exists in the New York market, with prices firm at 6.25c to 6.30c for spot, jobbing lots being slightly higher. Sales of soft Missouri are reported at 6.10c in car lots. On the London market soft Spanish brands closed Monday at £19 15s.

Spelter.—A steady market with a moderate demand continues. Spot is quoted at 6.85c to 6.90c for refined in car load lots. London closed steady on Monday at £26 2s 6d.

Antimony.—The market is easy with only small dealing. Quotations are as follows: Cookson's, 24½c to 25c; Hallett's, 23c to 24c; ordinary brands, 22½c to 23c.

Injunction Refused.—The temporary restraining order asked for about ten days ago by the Standard Tin Plate Co., Cannonsburg, Pa., to prevent president P. J. McArdle and other officers of the Amalgamated Association of Iron, Steel & Tin Workers from interfering with men going to and coming from the mills of this company where a strike is on, was denied this week after a preliminary hearing. It was shown that the officers of the association had not interfered with the men. This strike was declared within the past few weeks on account of the refusal of this company to sign the tin plate scale. The Amalgamated Association has also declared a strike against the mills of the McClure Tin Plate Co., Washington, Pa.

Nearly Ready to Start.—The extensive plant of the New York State Steel Co., of Buffalo, will be ready for operations between March 15 and April 1. The open-hearth furnace will be finished in a few days and the gas will be turned on next week. The open-hearth department and the mill will begin working simultaneously. Between 300 and 500 men are now employed at the plant and when the wheels turn, this number will be increased to between 500 and 1,000.

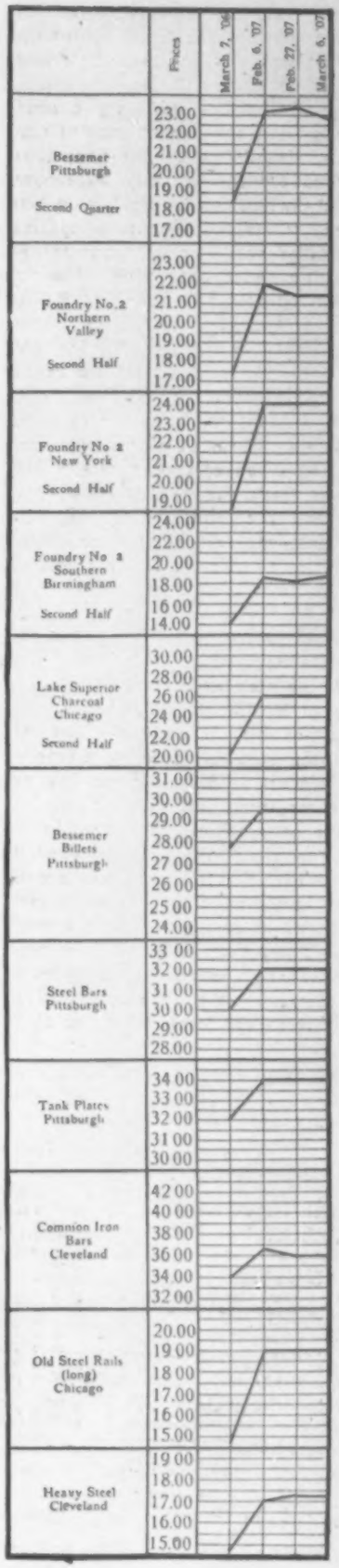
RAIL SALES SMALL.

(Special Telegram.)

New York, March 6.—Rail sales during the past week have been small. Trolley lines have been the principal purchasers. No large lots are included in the aggregate of 4,000 tons announced.

The Thomas Furnace Co., Milwaukee, Wis., has concluded to replace the present stack of its furnace with a new one of a capacity from 40 to 50 per cent greater. No suspension of operations will result from the installation of this improvement, except for a few days towards the end during which the final connections will be made. The present stack will be torn down upon the completion of the new one. No new equipment will be ordered.

PRICE CHART.



NEW HEAD FOR WELLMAN-SEAVER-MORGAN CO.

The election has been announced of Willard N. Sawyer to the presidency of the Wellman-Seaver-Morgan Co., Cleveland, to succeed S. T. Wellman, who has retired.

Willard N. Sawyer, the newly elected president and general manager of the Wellman-Seaver-Morgan Co., was born in Brimfield, Ohio, in 1863. His parents shortly afterwards moved to Kent, O., where they will reside. His early education was obtained in the public schools of that town. Leaving the high school before graduating, he prepared under private tutors for college, and in the fall of 1879 entered Hudson College, as a freshman, graduating in the classical course from that institution in the class of 1883 at Cleveland, where the college had been removed under the name of Adelbert College of the Western Reserve University. After graduating he started as special apprentice with the Southwark Foundry & Machine Co., Philadelphia, to obtain engineering experience, spending several years there in the machine shop and drafting room. In the spring of 1887 he left Philadelphia to go with Capt. Wm. R. Jones, general superintendent of the Edgar Thomson works, at the time the latter was building what was then called "The New Rail Mill," which has since with the Illinois Steel Co.'s rail mill revolutionized the rail making business of the world.

Mr. Sawyer was with the Carnegie Steel Co. over five years at Edgar Thomson, Homestead and Duquesne. He was in the armor plate department at Homestead and became engineer at Duquesne, leaving the latter works while occupying the position of engineer to accept the position of assistant superintendent of the Wellman Iron & Steel Co., Thurlow, Pa. He was later general superintendent of the Bellaire Steel Co., before its absorption by the National Steel Co., leaving that company in 1898 to become associated with the Wellman-Seaver Engineering Co., as engineer, which position he held for six years, until he was asked to assume the general managership of the "Soo" industries, which had just been reorganized under the name of the Lake Superior Corporation. While at the latter place, the Wellman Seaver-Morgan Co. suffered the loss of Charles H. Wellman and T. R. Morgan in the railway accident to the Twentieth Century Limited at Mentor, Ohio, and Mr. Sawyer from his long association with the company and intimacy with the work was asked to return at that time, but it was not, however, until the beginning of the present year that the change was made, when he returned as general manager, and at the annual meeting, which was held in February, was elected president and general manager.

Mr. Wellman, whom he succeeds, has been president of the Wellman-Seaver-Morgan Co., from its formation in 1896 to the present time. The death of his brother and of Mr. Morgan threw a great burden of work on him, which he felt unable to carry. It was to relieve him of this that Mr. Sawyer assumed active charge of the business. Mr. Wellman remains with the company, both in an advisory capacity and as a member of the board of directors.

PERSONALS.

Thomas H. McGechin has been appointed eastern sales manager of the United States Cast Iron Pipe & Foundry Co., with offices at 71 Broadway, New York.

F. E. Reed, president and treasurer of the F. E. Reed Co., builder of lathes, Worcester, Mass., is spending a few weeks in southern California for his health.

W. D. Mallette, superintendent of the plant of the American Steel Foundries, Sharon, Pa., has resigned to accept a position with another corporation.

Robert K. Story has resigned his position as general manager of the Central Radiator Co., Landsdale, Pa., after five years of active service in building and equipping the plant.

Myron B. Vorce, city inspector of buildings, Cleveland, O., resigned his office March 1 to become president of a company which will be known as the Vorce Engineering Co.

Arthur J. Aubrey, for some time chemist for the Laclede Fire Brick Mfg. Co., St. Louis, has resigned to become assistant superintendent of the Bessemer Lime & Stone Co., Bessemer.

Charles Rysdon, Chicago, has become interested in the Badger Steel Roofing & Corrugating Co., La Crosse, Wis., and has been made superintendent of the manufacturing department of the concern.

C. W. Lytle, superintendent of the Pittsburg plant of the American Steel Foundries, has been appointed district manager to succeed Harry Wright, recently elected president of the Ohio Steel Foundry Co., which will erect a new plant at Lima, O.

W. W. Hoit, who for a number of years has been general yardmaster of the N. Y. C. & H. R. railroad, at West Albany, N. Y., has become connected with the Quincy, Manchester, Sargent Co., with headquarters at the New York office in the West street building.

S. F. Long, assistant chief engineer of the Mesta Machine Co., Pittsburg, has resigned to take charge of the engineering department of the American Roll & Foundry Co., Canton, O.

Frederick Remsen Hutton, president of the American Society of Mechanical Engineers, has been relieved, at his own request, from his duties as professor of mechanical engineering at Columbia University, a post he has held for thirty years, during six years as dean of the faculty of applied science. After July 1 he will be emeritus professor.

T. Harry Huddleston, who has been connected with the Buffalo branch of the American Radiator Co., for six years as manager, has been appointed manager of the Philadelphia and Baltimore branches of the company. He will leave Buffalo soon to take up his new work.

Russell A. Alger, president of the Anderson Forge & Machine Co., Detroit, and vice president of the Packard Motor Car Co., has been elected president of Alger, Smith & Co., lumber manufacturers, Detroit, to succeed his father, the late Senator Russell A. Alger. Mr. Alger has been treasurer of the company for several years.

Joseph Wharton, the veteran iron master of Philadelphia, celebrated his 81st birthday there on March 3. Despite his many years Mr. Wharton is still active in directing his great business interests, which embrace several lines outside of iron and steel. He is now the largest individual producer of pig iron in the United States.

James E. Segue, first vice president of the American Locomotive Co., resigned March 1. Mr. Segue has been prominently identified with the business of locomotive building for 16 years. Previous to his promotion three years ago to the office he now vacates, he was for two years the company's chief mechanical engineer, and prior to that he was for 10 years general mechanical engineer of the Schenectady Locomotive Works. Herman F. Ball, vice president of the American Locomotive Automobile Co., has succeeded Mr. Segue as vice president in charge of mechanical engineering and designing of the locomotive company. He will retain his connection with the automobile branch of the corporation. David Van Alstyne has been advanced from superintendent of the Brooks plant of the corporation to vice president in charge of manufacturing. Both officials will have their headquarters at 11 Broadway, New York.

MILLIONS SPENT

By Pennsylvania System for Tracks and Equipment.

During the year ending Dec. 31, 1906, the Pennsylvania railroad system spent the sum of $8,701,474 for extraordinary expenditures. This outlay included such improvements as revision of grades and alignment, addition tracks, shops, yards, bridges, piers, stations and other terminal facilities, abolition of grade crossings and increase of equipment. Thirteen million dollars were taken from the earnings and applied toward the construction of the New York tunnel line. The principal expenditures for the current year will be in completing the four-track system on the middle Pittsburg and western Pennsylvania divisions, upon the tunnel extension into and through New York, and upon the terminal station in that city. Right of way will be purchased and additional relief lines built and motive power and equipment increased. In the annual report of the system, just made public, it is pointed out that improvements to enable traffic to be promptly and economically handled between Pittsburg and New York have been completed or are rapidly nearing completion. The aggregate cost of construction, equipment and real estate acquired on the main line between Pittsburg and New York during the year was $30,359,302. Gross earnings for the year amounted to $148,239,882, compared with $133,921,992 in 1905, and net earnings, $33,882,025, an increase of $5,902,656 over 1905.

Reciprocal Demurrage Passed.

The legislature of Alabama has passed a reciprocal demurrage law so that there will be two sides to this question in the future in that state. When the iron and steel manufacturers or even coal companies place an order for cars, not over 25 to be mentioned in an order, there will be a demurrage on all cars not furnished. Considerable demurrage is now collected in the Birmingham district by the railroads through the slow unloading of coal, coke and other cars in the industrial section.

Pennsylvania's Movement.

The official figures of the movement of passenger and freight cars on the Pennsylvania railroad lines east of Pittsburg for 1906 show a considerably larger proportion of increase in the mileage of passenger cars than in mileage of freight cars. The rate of increase in the mileage of freight cars was considerably less than in 1905, but the rate of increase for passenger traffic was much greater. The total freight cars mileage for 1906 on these lines amounted to 1,329,259,529, as compared with 1,270,722,562 in 1905, an increase of 4.6 per cent. The percentage increase of 1905 over 1904 was 12.7 per cent. The passenger car mileage shows 185,287,826, against 172,181,392 in 1905, an increase of 7.6 per cent, as compared with an increase of 1905 over 1904 of 4.4 per cent. In the locomotive mileage the figures stand 120,824,079 in 1906 and 113,533,613 in 1905, an increase of 6.4 per cent. The percentage increase of 1905 over 1904 was 10.7 per cent.

Many Equipment Orders.

Work will shortly be begun at the West Milwaukee shops of the Chicago, Milwaukee & St. Paul railway on 3,000 steel under-frame box cars. The construction of steel under-frame freight cars is a new departure for the road. The Norfolk & Western Railroad Co. has placed orders for 100 locomotives, 50 with the Baldwin Locomotive Works and 50 with the American Locomotive Co. The company has also placed an order for 1,000 steel coal cars with the Pressed Steel Car Co., and will build 1,500 coal cars at its own shop in Roanoke. More than 7,500 cars are now in process of construction to add to the freight equipment of the Erie railroad. These include 3,000 box cars, being built by the American Car & Foundry Co.; 500 produce cars now in process of delivery by the same company, 3,000 steel hopper gondolas of 100,000 pounds capacity, 500 flat cars, and 500 drop-end gondolas. The Erie has also placed an order for 35 freight locomotives.

ASSAULT AT BUFFALO.

The Buffalo Foundrymen's Association is investigating trouble which has arisen between its employes and the molders' union. A period of quiet had been enjoyed with only a few interruptions since the difficulties resulting from the strike of last May had subsided, but lately several union men have taken unfair measures in resenting open shop conditions which have been operating successfully in this district. Several serious assaults have been committed upon men employed in open shops and on Saturday night, William V. Young, an employe of the Fillmore Avenue Foundry & Iron Co., was waylaid while on his way home from work by three men. These men, it is said, were recognized by witnesses as employes of other foundries. Young was badly beaten up.

Matters are now being looked into by the Erie county district attorney, and it is believed the assailants will be brought to justice. Foundrymen feel that such assaults should be punished by imprisonment, but the police court justice sitting in Buffalo has inflicted fines instead, in no recent case being more than $10.

Notices were posted throughout the shops of the Day Foundry Co. Monday morning that the shop would hereafter be operated under only open-shop conditions.

COST KEEPING

Discussed by the Pittsburg Foundrymen's Association.—A Satisfactory System.

"Methods of Keeping Foundry Costs" was discussed at the monthly meeting of the Pittsburg Foundrymen's Association, held at the Colonial Hotel Annex, Pittsburg, Monday, March 4. H. D. Miles, of the Buffalo Foundry Co., Buffalo, president of the recently organized Jobbing Founders' Association, presented the forms of a system which has been recommended for adoption and which, despite its simplicity, encompasses all of the cost details required by the ordinary jobbing foundry.

A More Elaborate Plan.

J. F. Johnson, auditor of the Braddock Foundry & Machine Co., Braddock, Pa., a member of the cost committee of the Jobbing Founders' Association, presented a paper on the method in vogue in his plant, which was somewhat more elaborate than that given by Mr. Johnson.

W. A. Bole, general manager of the Westinghouse Machine Co., East Pittsburg, Pa., briefly discussed the method of cost keeping in the foundry operated by his company. He said that his experience in the engine business proves conclusively that many builders of these machines do not know their cost of manufacture. The phenomenally low bids often offered showed this, and several of these manufacturers remained in business only as long as their capital held out. In purchasing material he stated that he has had the same experience, one concern underbidding another as much as 50 per cent on certain classes of work, while on other jobs the reverse would be true. He concluded that these manufacturers likewise had loose systems of computing their costs.

Mr. Bole then presented a table which clearly indicated the method of splitting up the foundry payroll and which showed the relative cost per cent of the various classes of wage labor. This covered the 12 months of 1906 and is exceedingly valuable for its detailed information. The table follows:

	Per cent.
Wages of molders	35.7
Wages of helpers	7.4
Coremaking	12.8
Melting, including all the labor engaged at the cupola and in the yard	3.2
Day and night labor	6.9
Chippers and cleaning castings	7.0
Miscellaneous labor	3.6
Shipping	1.5
Wages of men employed in the light and power departments	2.0
Wages of men engaged in renewals and repairs to power plant	0.3
Wages for repairs and renewals to foundry flasks	3.3
Wages for repairs and renewals to cranes.	0.6
Wages of foundry foremen and clerks	6.7
Wages of blacksmith and helper for bar iron work and work on chaplets, etc.	0.4
Wages of laborers	0.3
Wages of superintendent and clerks	4.0
Electric crane operators	3.7
Lavatory attendants and yard labor	0.6
Total	100.00

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THE GREAT NATIONAL ISSUE.

The defeat of the shipping bill in the United States senate by the cowardly practice of filibustering has given the greatest impetus that could be given to national consideration of the question of American commerce on the high seas by the whole American people. To thus prevent the exercise of the will of the majority by such unfair means has been to make shipping the leading national issue. Subtracting all considerations of internal management, or more properly speaking, of our domestic economy, there is no question comparable in importance to that of shipping. It involves not only our commerce, but our political and martial relationship with every country on the globe. The question is none the less foremost in that it is enveloped in some obscurity in so far as the ordinary citizen is concerned. The same was true of the gold standard during the picturesque campaign of 10 years ago, and yet a sufficient number of the people were informed to elect a congress overwhelmingly pledged to preserve gold as the measure of value.

Alien and detached as shipping may appear to be to men in ordinary pursuits, nevertheless a sufficient number of the people of the United States were informed to elect a fair working majority in both houses favorable to shipping. A bill safe, sensible, entirely costless and in fact revenue-producing, certain to extend our trade with many quarters of the world, certain to stimulate industry and give employment to labor at home, and calculated to create a competent reserve for our navy, was passed by both houses of congress, receiving to an unusual degree the cordial endorsement of the administration and the support of the most enlightened and most dignified element in both houses. This measure was prevented from becoming law by tactics that are cowardly because they are unfair, and are none the less contemptible because they are legal. Apparently there is no rule, however beneficent, which does not work a hardship somewhere. We have no quarrel with the rule forbidding limitation of debate in the United States senate. It is doubtless a wise and thoughtful rule and has many times put a stop upon hasty and immature legislation, but its exercise against a well digested and well considered measure in the closing moments of a session is indefensible. No brave man would ever employ it, for a brave man will give even his worst enemy a chance. Under this rule, there is no chance in the closing hours of a session. The miserable, pointless and melancholy dribble of Carmack, Dubois and their one or two associates continued on Monday until the clock struck 12, and the fifty-ninth congress had, by the mere process of time, passed out of existence. There is a day of reckoning coming, however, when the Carmacks and those like them will be relegated to that oblivion which they have so richly earned and where they properly belong.

Scores of speeches, illustrated with practical examples, were made on behalf of the bill; not a single sound reason was advanced for its defeat by its opponents. The opposition was purely academic. The advocates of the bill drew their reasons from real life and their opponents obtained their arguments from books. One dealt with a condition; the other with a theory. Some day this country may have to meet with the condition and God grant that it may have more than a theory wherewith to meet it. Already there is rumbling in the Orient and if it should ever grow to a menace, which is not impossible, three things will be required to still it—ships, guns and men. We haven't got the ships. This country is entirely unprepared to enforce its just rights or to resist unjust demands over sea. Resourceful as it is, self-contained as it appears to be, its empire does not extend half a league beyond its shores. If tomorrow Japan should elect to take the Philippines and Hawaii, the United States could not prevent it.

The cause of American shipping is the cause of American labor, of national prestige and common defense. Modest as the Littauer bill was, it would have built 20 ships. It would have called for the expenditure of $20,000,000, of which $18,000,000 would have gone into the pockets of American labor. A ship is not built in a day. It would have kept every shipyard busy on the coast for a couple of years, and it would have influenced sensibly every industry from the mines of Lake Superior, the furnaces and mills of Ohio and Pennsylvania valleys, the machine shops of the middle west to the shipyards on both coasts. It would have stimulated trade with the Latin countries lying south of us, in itself an unexplored empire in so far as the American manufacturer is concerned. It would have relieved the manufacturer of the necessity of sending his products to Liverpool before they are delivered in South America. It would have permitted direct relationship with the South American republics, with the advantage of branch commercial houses and branch banks. No American business is going to establish a branch in these southern countries unless the avenues of communication between the branch and the parent house can be kept continuously open. The Littauer bill would have done this. No measure before congress during recent years has received from all classes such cordial endorsement as the shipping bill. It is on record that over 2,000 labor unions petitioned for it, while boards of trade and commercial organizations in all parts of the country sent resolutions endorsing it to congress. Great national associations like the National Board of Trade, National Association of Manufacturers and the American Bankers' As-

sociation made it a part of their proceedings, upon several occasions. Moreover, the administration espoused it, and even the speaker made a point of voting for it.

Is it not pertinent to inquire whether in the light of this widespread interest the shipping bill is not the leading topic under consideration today? THE IRON TRADE REVIEW believes that it is. It believes, moreover, that the setting aside of the express will of the people by the tactics of a few filibusterers will meet with merited rebuke at the next election. The campaign of education is on. The people are beginning to perceive the intense interest with which leading statesmen view this subject. In a commercial sense the present situation is ridiculous. Over $200,000,000 are annually being paid in freights to foreigners. In a political sense the present situation is fraught with the utmost danger. It is the duty of every citizen to study this question closely.

STEEL TIES NOT DOOMED.

The action of the Pennsylvania railroad in replacing the "experimental" steel ties in its track with wooden ties, after an official examination into the recent disaster at Mineral Point, Pa., has been given wide publicity during the past week, and in some quarters has been put forth as a sweeping decision, settling for all time the fate of the metal tie. The Pennsylvania is a great railway system, it is given credit for being capably engineered, and hence its return to the wooden tie has not unnaturally received undue prominence.

In point of fact, only about 3,000 ties were affected by the order. This is enough, roughly speaking, to lay about a mile of track. Any great catastrophe, which might have been avoided through human agency, is practically certain to be followed by an outburst of public indignation, which refuses to be appeased until the announcement of some action calculated, in the popular view, to decrease the likelihood of a repetition. Without wishing to question the honesty and sincerity of the Pennsylvania engineers making the examination, the speedy appearance of their report, the prompt decision against the steel tie, and the wide publicity given the verdict, affecting a total of one mile trackage of the system's thousands—all these factors, it must be admitted, smack strongly of the conciliatory effort.

No reference is made in the report or its announcement to the questionable wisdom displayed by the railroad in equipping with what it now terms "experimental" steel ties a section of track containing an extremely sharp curve on the brink of a steep embankment terminating in a river. The engineer of the luckless flier admits a speed of fifty miles an hour,—passengers insist that it was from twenty to forty miles an hour in excess of this figure. Yet there is no intimation in the report that future disasters might be guarded against by decreasing the speed of trains where the grade is heavy and the curve acute. Responsibility for the accident is tacitly centered on the steel tie, and it is announced that the old schedule will be maintained.

It is not claimed that the wreck would not have occurred had this particular section of track been laid with wood ties. The engineers say, however: "It is our judgment that less injury would have been done to the track structure." Indeed, if the commonly accepted theory is true—that some foreign substance became wedged between the inner rail and the flange of a tender truck wheel—it seems that the disaster was unavoidable. The fact of broken brake rigging would apparently suggest an avenue of improvement.

Whatever may be the effect of this much discussed action of the Pennsylvania, the death knell of the steel tie has by no means been sounded. At most, it can mean only a postponement of its general adoption. This is not a "test" of the device, that was completed long ago, before the steel mills began its production on a large scale. If they had not been certain that the tie was feasible and that ultimately it would come into wide favor, they would never have taken up its manufacture. Experience has proved that their confidence in the metal tie was well founded. Near Emsworth, Pa., it has been in use on Pennsylvania tracks for four years without a complaint. The Bessemer & Lake Erie railroad, with an enormous traffic, has found it satisfactory, and many other lines have taken it up extensively.

The early exhaustion of timber lands points unmistakably to the coming supremacy of the steel tie. Perhaps it has not yet arrived at its finished form; there may be later improvements calculated to give greater flexibility to the road bed. But the tendency has set in, and the hasty condemnation by one railroad on irrevelant and unproved charges will not stop it.

SHEET AND PLATE EXPORTS ARE INCREASING.

Exports of sheets and plates from the United States are steadily increasing. During January the shipments of iron sheets and plates amounted to 2,075 gross tons, compared with 746 gross tons in the corresponding month in 1906. For the past seven months ending with January, 1907, total exports of these sheets and plates were 13,673 gross tons, as against 5,524 gross tons the corresponding months ending in January, 1906, and 2,615 gross tons in 1905. The exports of steel sheets and plates in January aggregated 7,697 gross tons, as against 5,863 gross tons in 1906. The seven months ending January, 1907, in these products showed a grand total of 56,752 gross tons, corresponding with 39,421 gross tons, the same months ending January, 1906, and 40,331 gross tons in 1905. Steel rail exports for January, with 26,341 tons, showed a decrease over the same month a year ago when the total was 31,634 tons. Exports of steel rails for the seven months ending January, 1907, amounted to 174,648 tons, as against 197,731 tons in 1906 and 292,735 tons in 1905. Imports for January showed a total of 87,100 tons of iron ore, compared with 97,617 tons in January, 1906. The seven months totaled 579,229 tons, compared with 510,382 tons a year ago and 371,057 tons two years ago. Pig iron receipts were 50,005 tons, as against 25,070 tons in 1906, and an aggregate seven months' total of 283,020 tons in 1907, 150,047 tons in 1906 and 44,292 tons in 1905. In crude steel the imports for the month were 2,083 gross tons, as against 2,445 gross tons in 1906. The total imports for the seven months up to January, 1907, show 12,812 gross tons.

DECREASED DEMAND

For Light Machine Tools at Chicago —New Freight Tunnel.

Office of THE IRON TRADE REVIEW, 1362 Monadnock Block, Mar. 5.

Some of the dealers in light machine tools declare that the last week has shown signs of the hoped-for let up in demand, but the slackening seems to be limited to the demand in that line alone. Other machinery lines and the general trade is unaffected, and the factories are unable to keep up with their orders. The lighter demand is regarded by the members of the trade as a matter for congratulation. The constant fear among the more conservative machinery men has been of a sudden stop in the tremendous sales of the past year. Anything which gives grounds for the hope that the business will taper down to somewhere near normal is thankfully received.

No large lists have appeared in the past week and the only demand is for odd pieces. The expected list of the Big Four railroad for its new shops at Beech Grove near Indianapolis is being watched for eagerly.

In woodworking machinery the demand is increasing. One large firm reported that its orders for the first two months of this year are 25 per cent more than for the same period of 1906.

Second-hand machinery continues to sell readily because of the delay necessary to the purchase of new machines.

The full realization of the suddenness with which the Chicago & Northwestern railroad intends to act in building its new depot is just beginning to reach many of the machinery men who are tenants in the affected district. Firms which have been renting from year to year and whose leases expire May 1 find themselves unable to make any arrangements for extension of time in their present quarters as they intended, and they will be forced to find new offices immediately. They expected to remain in their present location from month to month until the buildings were wrecked.

The stock and machinery of the Globe Iron Works of Plano, Ill., was bought last week by the Scully Steel & Iron Co., Chicago. The Plano company failed two months ago and the stock was bought at receiver's sale. The plant is still vacant.

The A. D. White Machinery Co. will move from its present quarters at Canal street and Washington boulevard to 19-23 Jefferson street. Mr. White announced this week that he has secured a five-year lease on the premises. The company will occupy the first floor and basement, which will give it 20,000 feet of floor space.

The Marshall & Huschart Machinery Co., 62 Canal street, will move to a new building at 84 Jefferson street. The plans for the building are in the hands of the architects.

The Advance Packing & Supply Co. will move May 1 from its present quarters, 55 Canal street, to 123 Franklin street.

The American Wood Working Machinery Co., 43 Canal street, will remove from its present quarters before May 1. The sales office will be located in the Fisher building, suite 917. A new warehouse being erected for the firm at Thirty-sixth and Morgan streets will be completed by April 1 and the machinery will be on exhibit there. The new building is 80 by 150 feet and is situated alongside the tracks of the Chicago Junction railroad.

Relief for the congested traffic conditions of the down town districts of Chicago is promised by the announcement of the Chicago Subway Co. that the tunnel built by the Illinois Tunnel Co. will be ready to haul freight by May 1. Arrangements have been made to connect with the freight houses of 26 railroads. Openings have been made into more than 50 down-town office buildings, and direct connections will be made with many small shops. The officers of the company promise that everything will be ready for the removal of goods within sixty days. The tunnel is looked on by business men as an important aid in the prevention of any recurrence of the teamsters' strike.

The American Radiator Co. has decided to follow the plan recently tried by the United States Steel Corporation of offering stock to the employes. The company offers to buy stock in the market either preferred or common and sell it to its employes on the installment plan, the purchasers to give their note and secure the same by the stock bought for them. The plan has already proved successful in the works of the United States Steel Corporation. The employes have already subscribed for 250,000 shares at $102, the maximum amount which was offered.

STOVE FOUNDERS' CONVENTION.

The Stove Founders' National Defense Association recently held a special convention at Atlantic City, N. J. The meeting was principally to consider changes in the constitution and by-laws, some of which had become obsolete and inconsistent because they were in conflict with changes and conditions brought about by agreements made with several labor organizations, the present constitution and by-laws having been adopted nearly 20 years ago. A declaration of principles, practically the same as had been in vogue for the past 16 years, was adopted. The most important changes in the constitution and by-laws provide for the addition of a number of officers.

BRIGHT PROSPECTS

For the Exhibit of Foundry and Pattern Shop Supplies at Philadelphia.

The exhibition of foundry and pattern shop supplies and equipment, which will be conducted in connection with the twelfth convention of the American Foundrymen's Association at Philadelphia May 21-24 already promises to surpass all previous efforts in this direction. The Foundry Supply Association, under whose auspices the show will be conducted, has made a remarkable gain in membership during the past 30 days, the enrollment now numbering abou. 70, and more than 40 of these manufacturers have already been allotted space in the Second Regiment armory, where the convention will be held. The displays will encompass all lines of foundry equipment and appliances, and many new machines will receive their first introduction to the trade at that time. Arrangements have been made with the Otto Gas Engine Co. of Philadelphia for the installation of a gas engine which will be used to operate a 45-kilowatt generator, which will be installed by the Crocker-Wheeler Co., Ampere, N. J. This engine will not only drive this generator, but will also operate air compressors for furnishing compressed air to the exhibitors. The engine will be of the company's latest design, fitted with its patent electric igniter and rotary ball governor, which regulates the fuel consumption in accordance with the work accomplished All valves are mechanically operated. This company will show one or two of its smaller types of engines, as well as an Otto suction gas producer, from which it is claimed one horsepower can be obtained from one and one-half pounds of coal. Direct-current at 220 volts will be furnished the exhibitors requiring this power. The regular power current available, however, will be furnished by the Philadelphia Electric Co., and is alternating 220-volt, 60-cycle, 2-phase. A partial list of the exhibitors follows:

Arcade Mfg. Co., Freeport, Ill.
Berkshire Mfg. Co., Cleveland.
Bonvillain, Ph., & E. Ronceray, Paris, France.
Borgner & Co., Cyrus, Philadelphia.
Buffalo Forge Co., Buffalo.
Byram & Co., Detroit.
Cleveland Wire Spring Co., Cleveland.
Chicago Pneumatic Tool Co., Chicago.
Crocker-Wheeler Co., Ampere, N. J.
Detroit Foundry Supply Co., Detroit.
Dixon Crucible Co., Joseph, Jersey City.
Elliot, Debeoise & Anderson, New York.
Etting, E. J., Philadelphia.
Falls Rivet & Machine Co., Cuyahoga Falls, O.
Goldschmidt Thermit Co., New York.
Hanna Engineering Works, Chicago.
Herman Pneumatic Machine Co., Zelienople, Pa.
A. E. Hoermann, M. E., New York.
Hill & Griffith Co., Cincinnati.
Interstate Sand Co., Cleveland.
Killing Molding Machine Co., Davenport, Ia.
Koppel Co., Arthur, New York.
Lindsay & Co., W. W., Philadelphia.
Link-Belt Co., Philadelphia.
McCormick Co., The J. S., Pittsburg.
Mitchell-Parks Mfg. Co., St. Louis.

Mumford Co., The E. H., Philadelphia.
Obermayer Co., The S., Cincinnati.
Osborn Mfg. Co., Cleveland.
Otto Gas Engine Works, Philadelphia.
Pangborn, The Thomas W. Co., New York.
Paxson Co., J. W., Philadelphia.
Penton Publishing Co., The, Cleveland.
Pridmore, Henry E., Chicago.
Robeson Process Co., Camden, N. J.
Rockwell Engineering Co., New York.
Rogers, Brown & Co., Cincinnati.
Seidel, Inc., R. B., Philadelphia.
Sly Mfg. Co., The W. W., Cleveland.
Smith Foundry Supply Co., The J. D., Cleveland.
Southern Machinery Co., Atlanta.
Standard Sand & Machine Co., Cleveland.
Tabor Mfg. Co., Philadelphia.
U. S. Graphite Co., Philadelphia.
Western Foundry Supply Co., East St. Louis, Ill.
Wilbraham-Green Blower Co., Philadelphia.
Whiting Foundry Equipment Co., The, Harvey, Ill.
Yale & Towne Mfg. Co., New York.

Charles J. Caley, New Britain, Conn., vice president of the American Foundrymen's Association and president of the brass section of this association, has directed letters to brass foundrymen, platers, rolling mill and supply interests and all others interested in the brass industry, soliciting their membership in the National Brass Founders' Association, which is to be organized during the convention of the American Foundrymen's Association, which will be held in Philadelphia May 21-24. It is probable that the meeting of those interested in the brass industry will be held Wednesday morning, May 22, although this has not yet been definitely decided.

ALABAMA LEGISLATION.

Birmingham, Ala., March 4.—The Alabama legislature has passed a law prohibiting foreign corporations, those corporations which were chartered in other states than Alabama, from removing damage suits from county and state courts to the federal courts. It has been permissable where damages to the amount of $2,000 or more are asked for to get a removal of cases from the county and state courts to the federal courts. The law just adopted prevents the removal of suits hereafter.

The legislature has taken a recess until summer. The bill prohibiting the operation of freight trains on Sundays has passed one branch of the legislature and is likely to become a law.

Preparing to Rebuild.—The Hill & Griffiths Co., Cincinnati, manufacturer of foundry supplies and equipment, has already prepared plans for the reconstruction of its plant, which was recently destroyed by fire. The facing mill and the warehouse will be located in two separate buildings divided by firewalls. The warehouse will be three stories high and 80 x 72 feet in dimensions. The mill building will be 3½ stories high and 80 x 42 feet, and will contain 20 facing mills. Work on the erection of these buildings has already been commenced, and some of the mills will probably be placed in operation in April, although the entire plant will not be completed until June.

LARGE EARNINGS

Shown by Empire Steel & Iron Co. During the Past Year.

The Empire Steel & Iron Co., Catasauqua, Pa., enjoyed one of the most prosperous years in its recent history during 1906. The report for the year ending Dec. 31, 1906, compares as follows:

	1906	1905	1904	1903
Net earn..	$370,941	$135,751	$135,200	$388,529
Deprecia'n.	70,246	44,239	47,045	139,172
Net profit	300,695	91,512	88,155	249,357
Pfd. divs..	112,500	75,000	75,000	75,000
Balance .	188,195	16,512	13,155	174,357
Improvem't.	.....	.....	.....	137,553
Surplus	$188,195	$16,512	$13,155	$36,804

The comparative statement of results of operation for the past five years is as follows:

	Tons, Pig Iron.	Tons, Ore.	Net Earn.
1906	206,782	131,740	$300,695
1905	172,763	93,568	91,511
1904	163,202	111,375	88,154
1903	245,513	107,905	308,651
1902	186,485	59,179	203,087

During the year 1903 the company operated two furnaces under lease.

The board of directors of the company were re-elected and organized by the re-election of the retiring officers, with the exception that J. W. Fuller was chosen vice president in place of C. H. Zender, retired. The executive committee is composed of E. R. Chapman, Junius Morgan and A. A. Fowler.

WANT COUNCIL MEMBER.

The annual meeting of the members of the fourth district of the National Metal Trades Association, which includes all of New York State except New Greater New York, was held at Syracuse Tuesday evening, Feb. 26, and elected the following officers for the ensuing year: P. B. Kendig, Kendig Mfg. Co., Seneca Falls, N. Y., chairman; H. H. Franklin, H. H. Franklin Mfg Co., Syracuse, N. Y., vice chairman; directors, Henry May, George N. Pierce Mfg. Co., Buffalo, N. Y.; Kirk F. Knowlton, M. D. Knowlton Co., Rochester, N. Y.; W. B. Morrison, McIntosh, Seymour & Co., Auburn, N. Y.

Following the annual dinner, the members engaged in the discussion of matters of interest to the association, chief among them being the fact that the fourth district is not and never has been represented on the administration council of the National Metal Trades Association. The opinion prevailed that the size of the district entitled it to such representation and that steps should be taken to bring it about. A resolution was adopted asking the next annual meeting of the national organization to take the matter up. This resolution will be forwarded to the ninth annual convention of the National Metal Trades Association to be held at Boston March 21-22.

IRON AND STEEL PLANTS

May be Built by the United States Steel Corporation at Duluth.

The interviewing of one of the officials of the Oliver Iron Mining Co. by a committee of the Minnesota legislature investigating the ore situation has brought out a reiteration of statements previously quoted that the Steel Corporation is considering the wisdom of locating a blast furnace and steel mills at Duluth. The matter has gone as far as the submitting by the officers of the Oliver Iron Mining Co. of various facts concerning the advisability of such an installation to the New York office of the Steel Corporation, with the result that the finance committee of the corporation has adopted the following resolution:

"Resolved, that it is the sense of this committee that a substantial plant for the manufacture of iron and steel be constructed and operated in the vicinity of Duluth, Minn., provided it is practical and will be reasonably profitable; and,

"Resolved further, that the subject matter be referred to a special committee consisting of Messrs. Gary, Corey, Perkins and Frick, to make an exhaustive study of the question and to report facts at their earliest convenience to this committee."

The question of the wisdom from an economical standpoint of locating blast furnaces and finishing plants at the head of the lakes has been much discussed heretofore, but the opening up of immense tonnages of low grade ore adds much to the arguments in favor of locating at Duluth. The situation under circumstances of large production of low grade ore would be similar to that in Alabama, and would permit the ores of the western Mesabi to be used on a basis that will compare very favorably with results now obtained in the south.

NEW STEEL CASTING PLANT.

A converter steel casting plant having the capacity of 20,000 pounds daily will be built by the Curtis & Co. Mfg. Co., St. Louis, manufacturer of foundry cranes and saw mill machinery. Small castings will be made not only for the company's own use, but to meet outside requirements as well. The equipment will consist of two 3-ton converters, which are now being designed, as well as two cupolas in which the iron will be melted. The double installation provides for the idleness of each unit on alternate days to permit of such repairs being made as may be necessary. The foundry building will be of steel construction covered with galvanized iron, with dimensions 220 x 95 feet. A concrete sand shed 30 x 80 feet will also be built, in which the various grades of sand used in the foundry will be stored.

DEATH OF HOMER J. LINDSAY.

Homer J. Lindsay, assistant to the first vice president of the Carnegie Steel Co., and one of the original Carnegie partners, passed away at his home in Pittsburg on Tuesday, March 3, after an illness of about three months. The decedent, since its creation by Andrew Carnegie, was in active charge of the direct administration of the $5,000,000 trust fund set aside for the benefit of employes who meet with accidents in the mills of this concern.

Mr. Lindsay was born in Pittsburg, Dec. 7, 1859, and as the son of an affluent glass manufacturer, was afforded unusual educational opportunities. While pursuing his studies, he acquired a knowledge of stenography, typewriting and telegraphy, and at the age of 18 years secured a position as telegrapher to Thomas M. Carnegie. He was later appointed to the position of private secretary to Mr. Carnegie, and when the latter retired from the Carnegie Steel Co., he was given a position directly under the supervision of the president of the company. He later became connected with the sales department and made a specialty of selling rails, which, at that time, represented the bulk of the tonnage of this concern. Although latterly associated with the sales department, most of his time was given up to the administration of the trust fund. While his personal affairs and manifold business interests required much of his time, he took an active interest in the National Guard of Pennsylvania, enlisting as a private in Company K of the Fourteenth Regiment in 1879. He remained in this company eight years and served during the Pittsburg railroad riots in 1887. After severing his connection with the state militia, he was appointed aid-de-camp with the rank of lieutenant colonel by Governor Samuel W. Pennypacker. To his engaging personality and affable manner, as well as his exceptional ability is attributed his rapid advancement. He was as popular socially as in his business pursuits, and, although burdened with the responsibilities of his important position, he found opportunity to interest himself in a number of prominent clubs in Pittsburg and New York.

HOMER J. LINDSAY.

COKE COMMITTEE RETURNS.

(Special Telegram.)

Chicago, March 6.—The committee on coke ovens appointed by the United States Steel Corporation to investigate European coking plants has returned from its inspection aboard. G. G. Crawford, general manager, National Tube Co., McKeesport, Pa., D. R. Mathias, general superintendent, Illinois Steel Co., Joliet, Ill., Thomas McDonald, general superintendent, Carnegie Steel Co., Youngstown, O., and P. A. Miesner, 71 Broadway, New York, made the foreign trip. H. A. Brassert, superintendent of blast furnaces of the Illinois Steel Co., South Chicago, and James Gayley, vice president United States Steel Corporation, New York, are also members of this committee.

COKE PLANT COMPLETED.

(Special Telegram.)

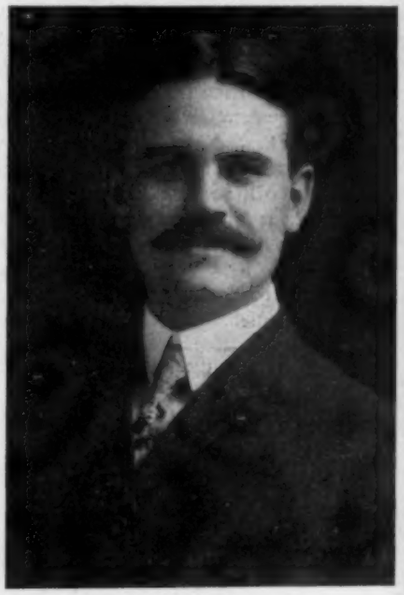
Pittsburg, March 6.—The Wilpen plant in the Connellsville region of the Shenango Furnace Co., has been completed and started 30 ovens last week and will have 70 more by April 15. By August it will have 350 and by end of year will have the entire 400 ovens plant operating. The product is being shipped to the company's Sharpsville furnaces.

Patent Rights Acquired.—The Carnegie Steel Co., Pittsburg, has purchased the patent rights for the sale and manufacture of the interlocking Channel Bar Co., Inc., Tribune Bldg., Chicago. The Carnegie Steel Co. is already equipped for the manufacture of these various sections.

Modern Machinery & Engineering Co. has been incorporated and acquired the business as selling agent for the Potter & Johnston Machine Co. and Landis Tool Co., formerly conducted by W. F. Flanders, offices at No. 309 Schofield Bldg., Cleveland, and No. 933 Monadnock Block, Chicago. Thomas F. Ahern, M. E., who has been manager of the Chicago office for the past two years and formerly with the Pratt & Whitney Co., is treasurer of the new company.

DEATH OF H. C. HOEFINGHOFF.

Harry C. Hoefinghoff, president and general manager of the Bickford Drill & Tool Co. of Cincinnati, died on Saturday evening, March 2, of uremic poisoning. Mr. Hoefinghoff was taken ill about three weeks ago, and was operated on for intestinal abscess. This operation was apparently successful, but uremic poisoning was a resultant and caused his death. He was born in Cincinnati about 35 years ago. In 1898, on the death of his father, he became the president of the Bickford Drill & Tool Co., and through his aggressive and modern business methods, brought the company from a small concern to one of the largest manufacturers of radial drills in the country. He was a member of the National Machine Tool Builders' Association, the National Metal Trades Association, the Manufacturers' Association and other kindred bodies. His opinions in the councils of these organizations were always accorded consideration. He was active in the development of foreign trade for American machine tools. He was kind and considerate with all with whom he came in contact and was well liked by his employes. He had a wide acquaintance throughout the United States and his reputation for honesty was unquestioned. His sudden death was a shock to his many friends and associates. He leaves a wife and three children.



HARRY C. HOEFINGHOFF.

Sons of Vulcan.—Indications are favorable for the re-organization at an early date of the Sons of Vulcan by the puddlers now members of the Amalgamated Association of Iron, Steel & Tin Workers. At a meeting held Sunday, March 1, in Pittsburg, a preliminary organization was effected.

THE WORKS OF MESSRS. HOPKINSON, LTD.

AN ENGLISH SHOP MANUFACTURING VALVES AND FITTINGS.

Special Tools for Special Work.—Shop Arrangement and Routing of Work to Save Time and Labor.—Welfare of the Men Considered.

By J. B. Van Brussel.

The owners of these new interesting works, have been for quite half a century specialists in boiler fittings, valves and other steam-plant accessories. The first works was established in 1843; as business developed, the old works was extended from time to time, but, a few years ago, as it was found impossible to maintain the output of boiler fittings and valves at the rate of demand, the erection of new works was decided. As a preliminary to the laying out of the new works, it was decided to make a careful investigation of the plans adopted by other firms under similar conditions, in order to attain, as far as possible, idealistic conditions, not only in respect to economy and efficiency of manufacture, but also convenience and comfort for the workers.

In the new works of Messrs. Hopkinson, Ltd., the machine department, which is, after all, the most important, occupies a central position. To the left of it is the iron foundry, and to the rear the brass foundry, from whence pass the castings into a receiving department immediately adjoining the machine shop. Into this also there are delivered supplies from outside sources. The tools in the machine shop are grouped suitably in separate bays, so that the work may progress from the rear to the front of the building, passing thence into the warehouse, or direct on to the loading deck or lorries.

In the construction of the buildings two main considerations were kept in view—facility of transport and adequate lighting. The ground has a fall from the rear to the front, and it was decided that while the two foundries could be at different levels, the remainder of the shops, including the receiving department, the machine shop, and the despatch warehouse with the main floor of the offices, should be on one level. As a consequence, there is a basement to the lower part of the machine shop, and this is partly utilized for workers' cloak rooms, bicycle racks and wash basins. As will be pointed

Fig. 1.—Interior of Iron Foundry.

FIG. 2.—INTERIOR OF BRASS FOUNDRY.

out later, the difference in the outside level and the floor level of the despatch warehouse has enabled a dock to be constructed for larries, so that the deck of the larry is level with the floor of the warehouse. The basement, or ground floor, in the office building is utilized for stock rooms and for a very well arranged show room. The main offices are on the first floor.

Turning now to a consideration of the departments and their equipment, we may begin first with a reference to the general offices and the drawing office. These are of exceptional height, the general office being a really fine room.

The iron foundry, which is well lighted, is 200 feet long by 80 feet wide, with a molding floor space of 16,000 square feet; provision is made for extension when that becomes necessary. With this end in view, columns, with corrugated iron walls, are left on the southeastern end. The cupola is accommodated in an annex, and the charging platform is entirely of steel. A hydraulic lift elevates material to this floor. In connection with the foundry there are several sand-preparing machines and the usual core drying stoves, etc. The overhead electric crane in the foundry is of 6 tons capacity.

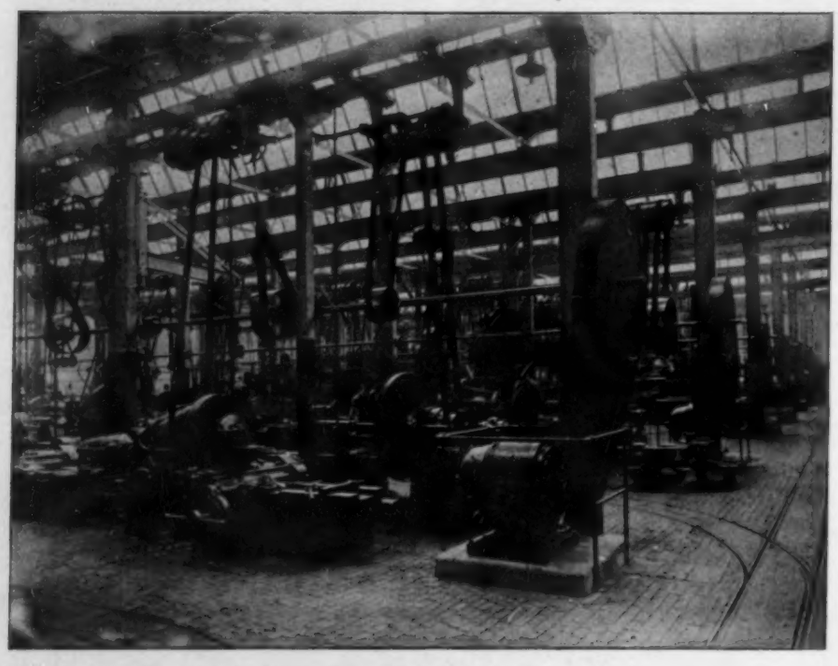


FIG. 3.—SYSTEM OF SHAFTING AND MOTOR DRIVE.

Steel is being more and more used for the valve bodies, etc., but lately the firm has introduced a new metal known as "platnam." With high pressures and particularly with superheated steam, gun-metal softens considerably, and Messrs. Hopkinson have evolved a composition which has proved effective from this point of view, being non-corrodible, and when tried with temperatures of 500 degees to 600 degrees Fahr., it does not lose any of its hardness. It is used for valves and for valve seats for installations where the steam is superheated.

The brass foundry, which is located to the rear of the main machine shops is a building 80 feet in width and 150 feet in length. Here also the mechanical appliances in connection with the castings are located in an annex. There are included sand riddlers and mixers with core making machines. The coke store is to the rear of the foundry proper, and the fuel is tipped in from a rear platform. The arrangement of the furnaces and the feeding of them is particularly convenient; ready access is found at the rear for repairs, etc., and each furnace is entirely separate, so that the fire may be withdrawn from any one for repairs without interfering with the work being done in the others. An arrangement is made for providing a mechanical blast, but owing to the location of the stoves and the width of the passage to the rear, natural draft is found quite sufficient. The molding benches are arranged down the center of the shop, the machines being on the side nearest the furnaces.

Separating the brass foundry from the main machine shop is a large store for receiving not only the brass and iron castings made in the works, but also the supplies from outside sources; and it is an important item in the administration that all material to be formed into one or other of the specialties of the firm enters the works through this department alone. This building is on a slightly lower level than the brass foundry, but on the same plane as the machine shop. It is fitted with galleries for the storing of castings, etc.

The machine shop is 280 feet by 260 feet, with a floor space of 72,800 square feet. It is divided into bays of 20 feet for the full length of 280 feet. All the iron and steel work is done at the

northeastern ends of the bays, the brass work and steam gage work being carried out at the other end, while in the center are located those departments which are common to work irrespective of metal. Each bay in the shop is designated by a letter, and the tools for each distinctive process in the iron and steel departments are grouped within a bay, and these groups are arranged so that the unit being manufactured will pass in order through the house and despatching departments. The buildings are of brick work, and the roof principals, columns, etc., are of steel. The span is 40 feet, and the principals are at 20 feet centers. The slope on each side is at an angle of 30 degrees and two-thirds of the northern slope is glazed. The columns are built up of H joists, the height to the crane-rail level being 22 feet. In the case of the machine shop the columns are also at 20 feet centers, and the

FIG. 4.—DRILLING BAY, SHOWING A NUMBER OF SPECIAL DRILLS.

bays, starting from the rough casting stores. Thus on the iron side there is first the smiths' shop, then the heavy turning and boring bay, the planing and milling bay, the drilling bay and small turning, and so on until the fitting and hydraulic testing sections are reached. Similarly, in the center of the shops, there is first the department for the making and grinding of tools and the tool stores, the shop management department, and finally, the store for finished parts of valves, etc., and the assembling and erecting department, the latter having communication direct with the ware-

span is 20 feet. Here the principals are for a saw tooth roof; the angle on the northern side, which is glazed, is 60 degrees, to the south, where the slope is 30 degrees, the covering is of boards and slates, with suitable ventilation at intervals. The principals are in both instances built of T and flat-bar sections riveted together.

Special consideration was given to the construction of the floors. That used in the part of the machine shop where brass work is carried out, has a bottom of concrete breeze, 8¾ inches thick, with 1¼-inch maple flooring boards on top, grooved and keyed into the concrete and half-lapped at the ends. The floor on the side of the shop devoted to iron and steel work has a bottom of concrete, with wood blocks, 7 x 3 x 4 inches on the top.

In the tool store of the machine shop there is a very complete system of tools, gages, and jigs, the system of standardisation carried out through the works having admirably lent itself to a comprehensive system, which the management has utilized to the fullest extent. The tool room is separated from the remainder of the shop by a screen of expanded metal, and the tool gage or jig is handed out upon the presentation of a card having the foreman's stamp; the workman in exchange gives a token having his number upon it, this token taking the place, in the pigeon-hole or rack, of the gage or tool. At the end of each week every article taken from the store must be returned. In the tool-making department there is a good equipment, including a smithy and hardening department, with special water grinders for twist drills, Sellers'

and Gisholt's tool grinders, Brown & Sharpe's universal milling machines, universal grinders, shaping machines, and several lathes and drilling tools.

It will be noted that the machines are driven from shafting supported on the columns about midway in their height, such counter pulleys as are necessary being carried on bearings suspended from the crane girders. Each line of shaft is operated, by means of a Reynold silent chain, from a motor carried on concrete foundations on the floor level. The chain is very snugly housed within a sheet-iron casing, closely resembling in form and construction the gear case of a lady's bicycle, the larger gear wheel being of course, on the shaft. Several Bullard's boring mills and other good makes are present, including one of Richard's vertical boring machines.

Milling is very extensively employed, although large parts are still planed.

An examination of the milling bay brings out strongly the advantage of dispensing with cross belting, as well as the adoption of saw-toothed roof, as there is neither glare nor shadow. Drilling of flanges is done entirely to jig. In the drilling bay are shown interesting examples of multiple drilling machines. One of these is an eight-spindle multiple drilling machine for drilling holes in one or more flanges to steel bushed jigs. The drill headstock is fitted with eight drill-spindles, which can be separately adjusted to suit any diameter of flange by screws set in nuts on the bottom edge of the headstock. The top of the spindle is connected by a ball knuckle-joint to the horizontal pinion engaging in the gear wheel, connected to the large driving wheel, which, again, is driven by gearing supported in the standard. The headstock is raised and lowered on the framing by means of a chain gear.

Another tool is a special machine for boring the bosses of wheels to limit gage. The turret carries four tools, set according to the sequence of operations—one for rough boring, a three-tipped tool for finished boring, a rough solid reamer, and an adjustable reamer for finishing. Not only does this insure rapidity of work, as only one setting is necessary, but it makes for accuracy. There are several four spindle drilling machines, where the table is arranged to move vertically by hand on the two standards, while the headstock travels laterally across the saddle. For drilling in line this gives a very wide range.

As regards the department where the brass work is carried out, there is a complete equipment of tools, but it is scarcely necessary to enter into details regarding these. A passing reference, perhaps, should be made to a small vertical drill fitted with a special attachment for rapid machine tapping, there being an automatic gear fitted to supercede the handwork. Many of the screw threads are milled instead of turned, as it is believed that this method is more precise. In this case the headstock advances, and the rod rotates while being screwed. This milling tool is illustrated by Fig. 7.

The valves, gages, etc., having been thus completed, are passed to the steam or hydraulic testing department,

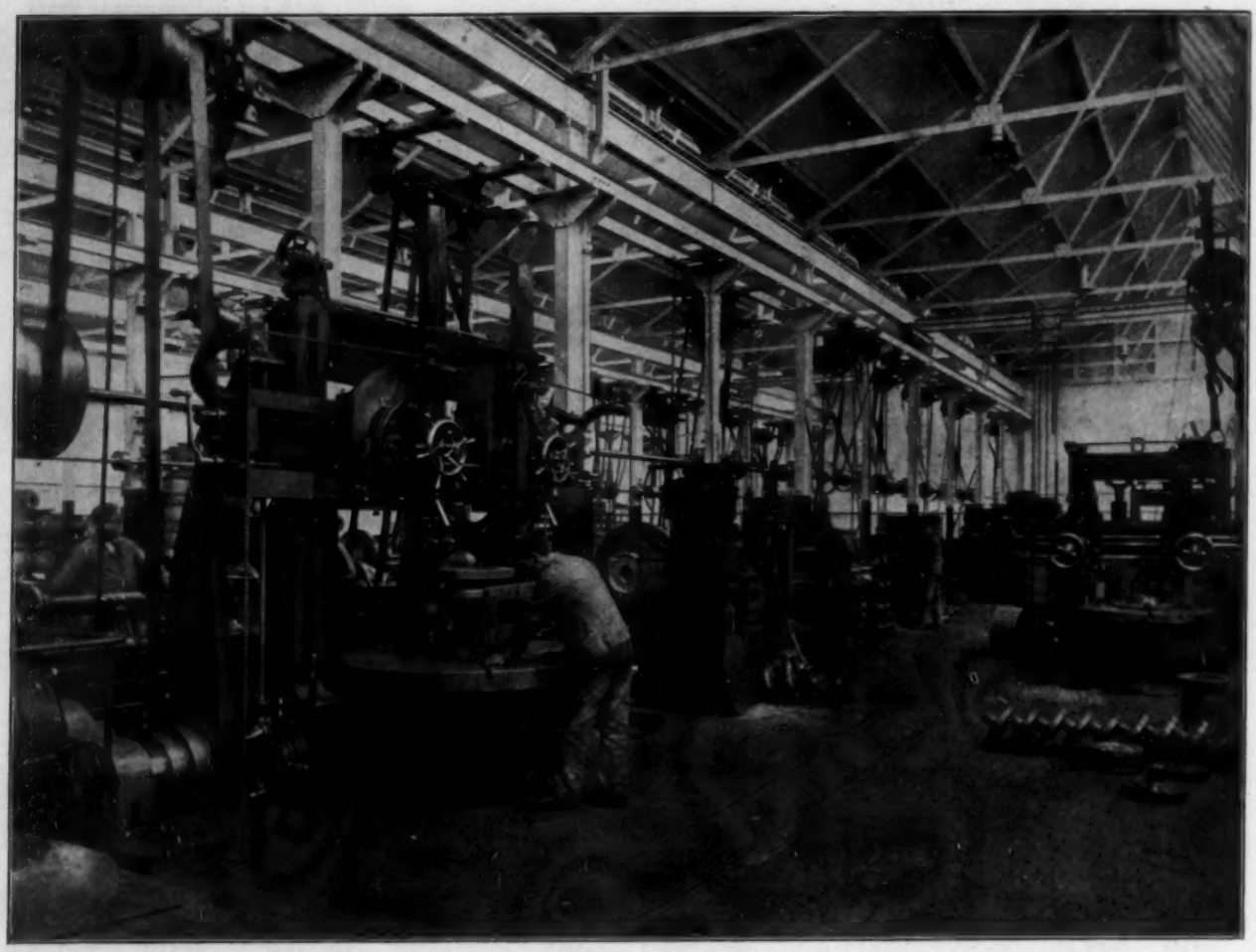


FIG. 5.—BORING BAY, IRON AND STEEL SHOP.

FIG. 6.—WAREHOUSE.

and finally to the inspection department. Considerable importance has always been attached to the testing of the manufactures. At various stages throughout the work this testing takes place, special hydraulic appliances being utilized; while a boiler for working at 400 pounds pressure is fitted for steam testing.

After inspection and painting, the manufactures pass to the warehouse. This building is 160 feet x 40 feet wide, with two galleries running around three sides, giving a total floor area of 20,000 square feet. There are electric hoists communicating with the galleries. The ground floor is on the same level as the machine shop, which at this point is considerably higher than the level of the ground outside. This greatly facilitates the loading of the manufactures into larries, as, when they are backed on ground level into the loading-bank, the deck is level with the floor.

The works are run entirely by electric power. Two boilers generate steam at 180 pounds pressure for two direct-coupled steam-electric plants—one large and one small; the larger one consists of a Bellis two-crank engine, driving, at 380 revolutions, a multipolar compound-wound dynamo. The smaller set is a two-crank engine, driving at a speed of 450 revolutions, a multipolar compound-wound dynamo. The large engine is capable of working up to 400 brake horse-power, and the smaller one to 200 brake horse-power. The current is generated at 220 volts at the main switchboard. The dynamo cables pass by means of earthenware pipes to a point behind the switchboard. The works are lighted with about 160 Jandus arc-lamps, of 1,000 candle-power, run two in series. The general and private offices are lighted by incandescent lamps, run from the company's power plant during the working hours; after the works are closed, a switch is changed over to the Corporation main.

The power station, while serving the purpose of driving the works, is also utilized for showing in operation the various valves and fittings which the company manufacture. In other directions the firm has shown consideration for their men, which is appreciated. Dining places have been arranged, with special gas-cooking stoves, where the men's food is warmed. Sometimes as many as two hundred, or one-third the number employed, take their food in these rooms. Above the drawing office there is a large lecture room, where, beginning this winter, a series of lectures will be delivered to the workmen, free of charge. A site has been arranged, as a continuation of the frontage of the works offices, for a workmen's institute, which is soon to be built, with accommodation for a reference library as well as recreation rooms. On the ground reserved for extension it is proposed to lay out allotment gardens for the workmen.

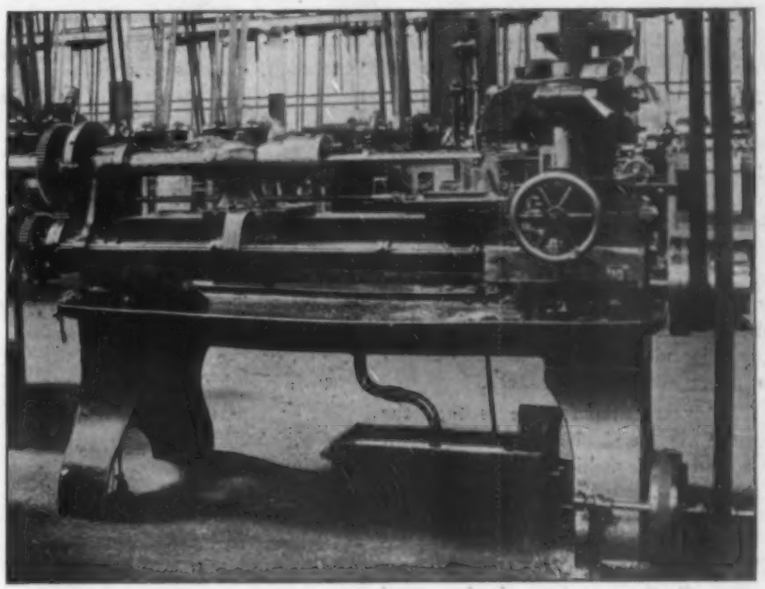
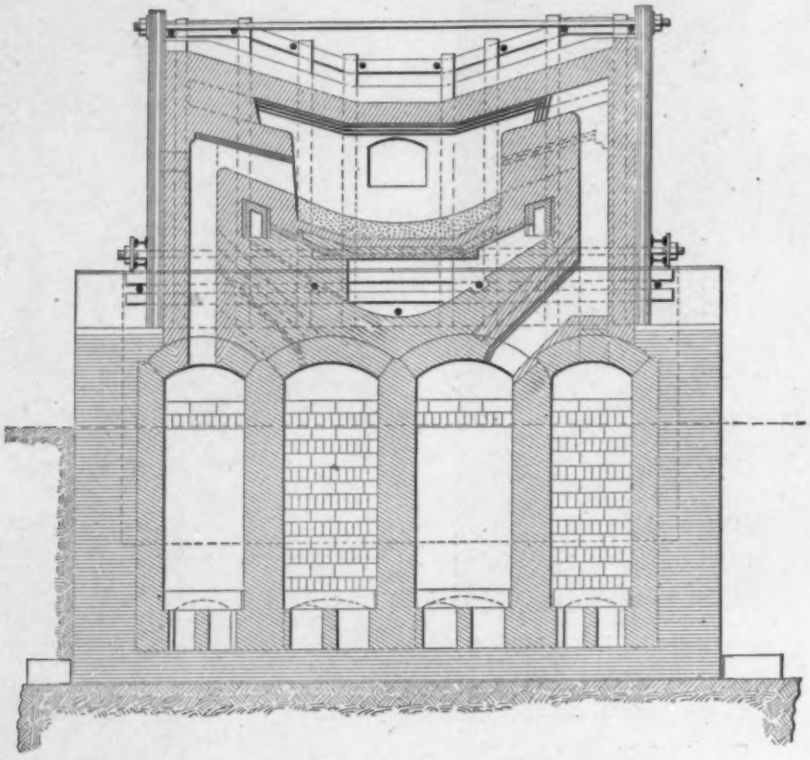


FIG. 7.—THREAD MILLING MACHINE.

A RUSSIAN OPEN-HEARTH FURNACE.

By W. M. Carr.

In these days of large units and tonnages it is interesting to pause in our study of the problem involved and note what is being accomplished in Europe with small equipment. The cut given herewith shows the lines of an acid open-hearth furnace of one ton capacity and capable of being enlarged to 1½ tons. The hearth area is only four feet by five feet seven inches. The furnace is in successful operation by a concern engaged in the manufacture of agricultural machinery and some smaller parts used in mining appliances, located at Berdiansk, an important grain shipping port on the Sea of Azov. The fuel is producer gas made from a low grade slack coal which yields only 37½ per cent of gaseous matter and leaves a heavy residue of ash. The same coal is briquetted and used as a source of heat in firing annealing furnaces.



A Russian Open-Hearth Furnace.

The interesting feature is that the furnace is used both in malleable iron and steel melting, frequently alternating between the two, and it is possible to make three heats per 24 hours of either kind of metal.

The shop is not fitted with crane service, all the pouring of the metal being done by hand ladles, going into machine made green sand molds. In no case do the castings exceed 750 pounds each.

The molding sand is a white quartz bonded with kaolin and tempered with a solution of a by-product from a sugar factory (no doubt molasses.) In this particular the practice is not far from that of our leading steel foundries in the United States.

The contrast between a Talbot 200 ton furnace and the furnace in question is striking. With the possibility of rich fuels as found in the United States, together with many available grades of melting stock, it might be ventured that a small open-hearth furnace of similar lines and dimensions slightly improved might meet a need in this country where the demand for small steel castings is constantly increasing.

The writer is indebted to Jno. E. Greaves, Esq., president of the concern, for the courtesy of the furnace drawing and description.

Official figures as to the coal production in Alabama for the year 1906 show that Alabama produced 11,446,161 tons of coal against 11,900,153 tons in 1905. The falling off in output is accounted for in the railroad car shortage.

THE LE CHATELIER RECORDING PYROMETER.

The Le Chatelier thermo-electric pyrometer consists of a thermocouple of platinum and rhodio-platinum elements and a simple galvanometer whose needle passes over a graduated scale giving temperature indications. This was the first practical pyrometer for works use. When such a thermocouple of two dissimilar wires is heated at the junction of these wires, an electric current is generated in the couple which bears a definite relation to the difference of temperature between the hot and cold ends of the couple wires. The galvanometer serves merely to measure the current, which is a light one.

This same principle is applied to the making of a more useful pyrometer by employing a recording galvanometer instead of an indicating instrument. The value which a recording instrument possesses is due to a number of things. Its record furnishes the intelligence for the repetition of any course of temperatures that has been found most advantageous by comparison with various records with various qualities and results. Furthermore, the record may be filed away, properly marked, for identification so that if any material made at any given time is subsequently found defective, it can be determined by means of the record if the fault was due to improper temperature regulation. In addition to the above, the fact of a record being made of the course of temperature that a furnace is undergoing causes the fireman or furnaceman to attend properly to his work. There is a danger, however, that the fireman may come to look upon the recording instrument as an enemy, inasmuch as it will reveal any error of omission or commission in his work. This attitude on the part of the fireman should be discouraged by some means. For example, in England it is a practice to give to the fireman a small bonus for making records which show good firing. A glance at a recording pyrometer not only shows what the temperature is, but also its general trend upwards or downwards.

The accompanying illustrations, Figs. 1 and 2, show recorders for the La Chatelier pyromoter, which may be used in connection with platinum couples for temperatures ranging from 575 to 2,700 degrees Fahr., or with base metal thermocouples from room temperature to 1,300 degrees Fahr. Base metal couples will give true readings up to about 1,900 degrees Fahr. for a few hours or days, but there are no thermocouples of base metal that will hold their accuracy even roughly if employed for a total of many hours over

1,300 degrees Fahr. Neither will they recover their efficiency if laid temporarily aside.

Fig. 1 shows a recorder for a period of 26 hours. The needle of the galvanometer carries a reservoir pen. The record paper is mounted upon an aluminum drum, which is lifted by a clock at two-

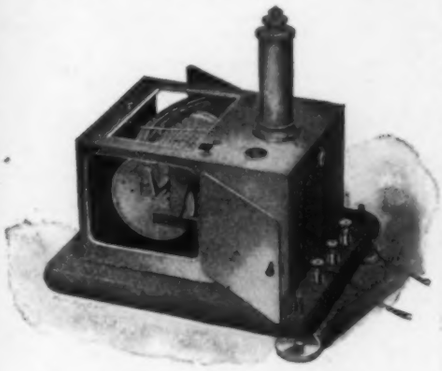


FIG. 1.—26-HOUR RECORDER.

minute intervals, so that the paper comes up to the point of the pen which makes a dot upon it. The drum immediately retreats and allows the needle to find a new position, if there is any change of temperature. Fig. 2 shows a recorder in which there is a roll of thin opaque record paper which advances at the rate of 5/8 of an inch per hour. A single roll of paper will serve for a whole year giving a 24-hour per day record. In this instrument a ribbon of carbon paper travels across the record paper and under the needle of the galvanometer. The needle carries a hard pointed stylus projecting upwards. A boom in the form of an arc is above and across the needle. This boom is raised by a clockwork, and then is allowed to drop of its own weight upon the needle, forcing the stylus upon the carbon paper, and so making a dot upon the record paper. These dots are made once a minute and as the needle is free from any contact for the greater part of each minute, it is not hindered from taking its true position before it is caught by the dropping boom. This instrument is intended to be locked practically all the time, the record feeding out through a slit in the case. The winding, starting and stopping of the clock is done through an opening with a sliding door.

In order to take temperatures higher than the thermocouple will stand, such as temperatures of molten metals, slags, etc., the Fery radiation pyrometer is employed in conjunction with the above described recorders. In this instrument rays from the hot body are brought to a focus upon the thermocouple junction, and from this point the instrument is merely a thermoelectric pyrometer not differing greatly from the Le Chatelier instrument. To operate the instrument, it is sighted upon the metal or other mass or into the furnace and readings are taken from the galvanometer. The instrument is quick acting, giving true readings within ten seconds after being properly sighted. Readings do not depend upon the distance of the instrument from the hot body, as the screw that is turned to bring the observed object into focus through the optical system that is supplied for the eye, serves also to move a concave mirror back and forth in the telescope and simultaneously the optical focus brings the heat radiations into service upon the thermocouple. The thermocouple remains constant in size, but the image of the hot body becomes smaller as the instrument is moved further away. The thermo-junction does not receive all the heat radiations that fall upon the mirror, but only those which go to make up that portion of the image which fall upon the thermo-junction. As the image becomes smaller as the instrument is moved away, it is evident that the thermo-junction will receive a constantly increasing percentage of the rays that fall upon the mirror. On the other hand, as the instrument is moved away, the mirror receives less radiation from the hot body. The two effects neutralize each other, and as long as the instrument is never moved so far from the hot body that the image on it will be too small to at least cover the thermo-junction, the latter will be receiving a constant amount of heat for all distances with the ultimate result that the reading on the galvanometer does not change.

The telescopic portion of this instrument is mounted upon a tripod and the whole packs neatly into a box. This pyrometer has a range of from 500 to 2,000 degrees Cent. (932 to 3,632 degrees Fahr.), and its readings are independent of the room temperature. It may be at any distance from the hot body within the limit that it must not be more than a yard away for every inch in diameter of the face of the body observed, or the aperture through which the rays come to it from the furnace. It is used with a record or indicating galvanometer exactly as a thermocouple of the Le Chatelier type when so desired. These pyrometers are being introduced into this country by the Wilson-Maeulen Co. 110 Liberty street, New York.

Corrugated Iron in Africa.—Consular reports state that the value of corrugated iron imported into Cape Colony in 1905 amounted to $833,718. Of this amount $812,224 was the value of the British imports, the quantity imported from the United States being so small as not to be separately defined in government statistics. Of the total amount imported that which was entered for consumption in Cape Colony alone was valued at $764,916. Corrugated iron is being sold to Cape Town builders and contractors at about $73 per ton of 2,000 pounds and galvanized sheet iron at about $70.56.

FIG. 2.—CONTINUOUS RECORDER FOR ONE YEAR.

Materials and Properties of Wrought Pipe.[1]

By F. N. Speller.[2]

For years wrought iron was the only material available for the manufacture of welded tubes and pipe, but within the past fifteen years the making of weld-steel has become a special branch of the steel industry and furnishes a material having many advantages for mechanical welding operations.

Fig. 1.—Charging Double-Length Butt Weld Furnace.

Enumerating the chief metallurgical processes in historical order, we have, first:—The making of charcoal iron from charcoal pig iron: The silicon and manganese are first almost completely removed by melting the pig iron in the refinery or run-out fire. The plate metal from this furnace is further refined in the "knobbling fire," using charcoal for fuel. This is interesting as being a slightly modified form of the furnace used in the early days of the iron industry for the making of wrought iron and steel direct from the ore. The bloom produced is repeatedly heated and hammered, and finally rolled into a bar, which is re-piled four or five feet high, heated to a welding temperature, and rolled into a plate, preferably in a continuous mill. This is the finest wrought iron which can be made, and is still used in the tube works, although in decreasing amounts, principally in the manufacture of boiler tubes. The following average analyses of several heats will indicate the progress of the refining at each operation:

	Total Carbon	Manganese.	Silicon	Phosphorus	Sulphur	Oxides and Cinder
Pig Iron	3.85 per cent	0.980	0.940	0.086	0.025	....
Refinery Metal	3.50 (Comb)	Trace	0.210	0.070	0.024	....
Finished Plate	Trace	Trace	0.014	0.024	0.014	0.92

The puddling furnace furnishes wrought iron of a much coarser grade, better adapted for standard pipe, having the following average composition:

Silicon	0.100
Phosphorus	0.220
Manganese	Trace
Carbon	"
Sulphide	0.020
Oxides and Slag	2.00

The strenuous nature of the work is well known to anyone who has watched a puddler around his furnace. An operation of an hour and a half in the furnace reduces the charge of pig iron to a 500-pound mass of refined iron of pasty consistency, which is divided into two balls to facilitate handling. The product is unfortunately hard to regulate in quality on account of:

(1.) Irregularities in composition of pig iron used.

(2.) The small quantity made in one heat.

(3.) The amount of personal attention and skill required on the part of the puddler and the large personal equation thereby introduced.

Iron made by this process today is rendered still more unreliable by the practice of intermixing steel scrap of various composition.

By carrying the Bessemer process to the limit of refining, and treating the metal so as to give the best results in welding a refined iron is produced practically uniform in quality, which will roll into a plate with a true edge, a very desirable condition for good results in the pipe mills. To obtain the best results it is necessary to manufacture "pipe steel" on a scale sufficiently large to take

Fig. 2.—Drawing Butt-Weld Pipe.

[1]A paper read before the Engineers' Society of Western Pennsylvania, November 20, 1906.
[2]National Tube Co., Frick Building, Pittsburg, Pa.

the full capacity of a steel plant. Under these conditions it is probably safe to say that a uniformity of product is obtained unequaled by any other class of steel manufactured on this scale. A smaller proportion of pipe steel is made by the basic open-hearth process, but the easy control and continuous supply of uniformly very low carbon steel which can be had from a Bessemer plant running in conjunction with pipe and tube mills, and the satisfactory nature of the product, has caused the Bessemer process to become generally used for this class of work. The higher phosphorus and sulphur contents are no objection in welded pipe where the quantity of metal used is so greatly in excess of what strength requires, and moreover these elements become a necessity if the pipe is to be tolerably easy to thread.

Pipe steel welds with greater ease and with much less loss on account of blisters and laminations than wrought iron.

Growth of the Tube and Pipe Industry.

The production of welded tubes and pipe has almost doubled in tonnage since 1899. During this period the process of making pipe steel and mechanical welding by the butt and lap weld process has been much improved, giving a more uniform product and at the same time reducing costs all round. The introduction of pipe steel has apparently had somewhat the same influence in expanding the field of use for tubular goods as the advent of structural steel exercised on the production of materials of construction formerly made of wrought iron. Last year (1905) the production of tubular goods in the United States (1,435,995 tons) nearly equaled that of rolled structural shapes (1,660,519 tons) not including plate. The demand this year (1906) promises to reach 1,700,000 tons.

The generally good welding quality of wrought iron enabled it to maintain its position for the manufacture of pipe years after it had been displaced by steel as a material for general engineering construction. In 1890 about three per cent of the welded pipe was made of steel; in 1905 this had increased to 70 per cent, and it is estimated that steel pipe will constitute 80 per cent of the output of 1906. Besides the general use of pipe in steam, water, gas and oil lines, which consumes the larger part of this tonnage, increased amounts are being used for trolley poles, electric conduits, bedstead canstruction and for other special purposes.

Among the special uses to which steel pipe lends itself, the catenary system of trolley suspension might be referred to. Large quantities of the small sizes of extra strong pipe are used in making the light triangular frames from which the live wire is suspended in high speed electric railroad construction. The joints are either threaded, or flattened and pinned together. Steel pipe combines a maximum strength with a minimum weight, which is very desirable for such work. Wherever pipe has to be bent or worked either hot or cold the modern material has a decided advantage.

In the California field a quantity of steel pipe has been rifled, the object being to cause the viscous oil intermixed with a small per cent of water to whirl as it moves rapidly through the pipe, thus when a sufficient velocity is attained, a layer of water flows between the oil and the pipe reducing the friction in the line.

It has been found quite practicable to roll spiral corrugations 3-32 in. deep in the surface of the pipe by means of six wheels set equidistant around the circumference and slightly inclined to the axis of the pipe, so as to make a complete revolution on the surface of the pipe every 10 feet. The material ap-

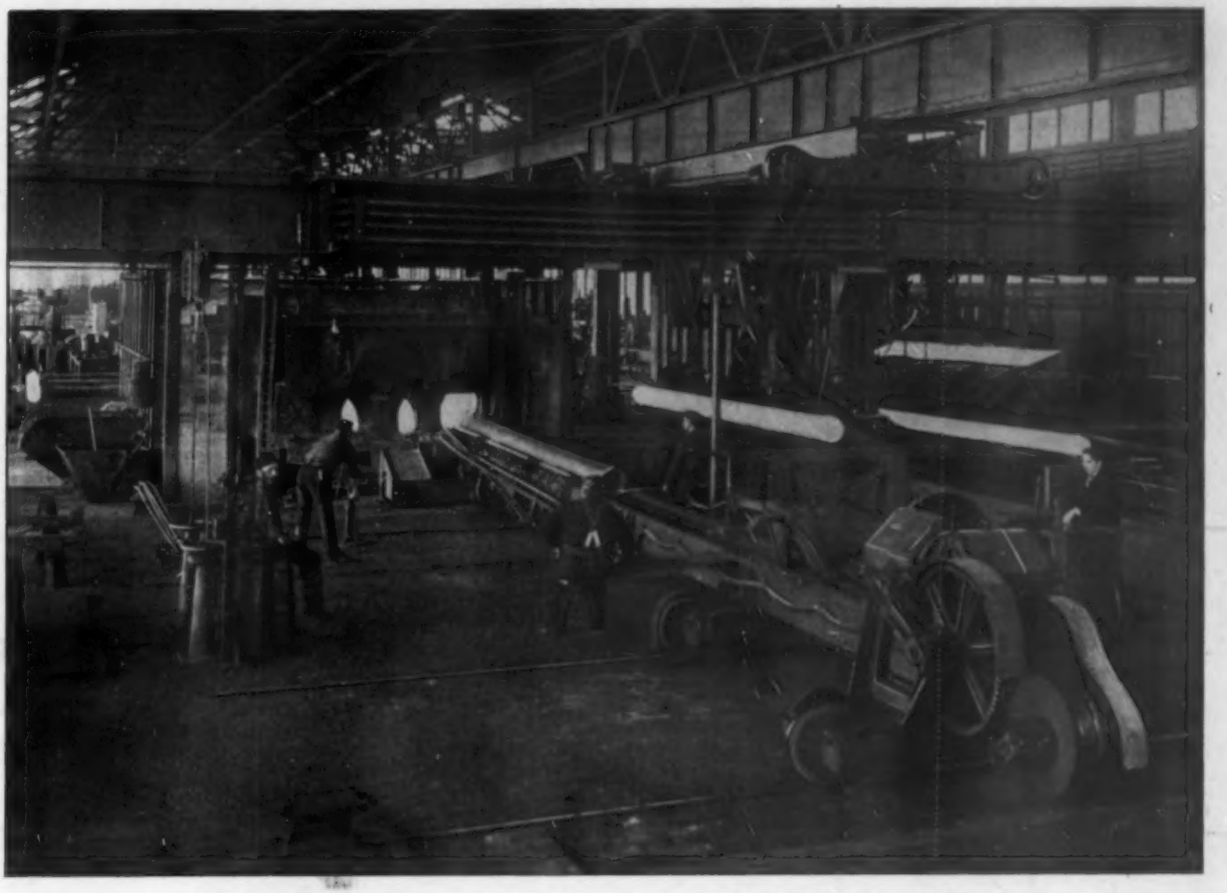


FIG. 3.—CHARGING END OF LAP-WELD FURNACE, SHOWING ALSO BENDING OF PLATE.

pears to stand this treatment cold without difficulty.

It might be well to refer here to the heat treatment necessary to anneal pipe steel. The heat required to weld iron or steel produces a larger grain in the metal. For most purposes this does no harm and steel pipe unannealed will stand severe cold bending without fracture, having an elongation of 20 to 22 per cent in this state, but where the pipe has to be worked hot it is advantageous to first heat to a full orange (above the critical range or 900 degrees centigrade) for a few minutes and allow it to cool in the air. This will completely remove all possible effect of overheating by refining the grain, and will enable the metal to be worked without danger from red shortness. Tubes or pipe will also stand more cold working without fatigue if so annealed.

Principal Physical Characteristics of Pipe Materials.

From the manufacturing standpoint, the superior welding quality, uniformity and lower cost of pipe steel are the determining qualities. These cannot, however, be obtained to good advantage without working on a large scale and manufacturing this grade of steel exclusively. The tensile strength of pipe steel pulled transversely is about double that of wrought iron, hence the welded seam might be expected to be proportionately strong. This has been shown to be true by experiments on 2-inch butt welded pipe. The average strength of the weld was thus found to be 70-72 per cent of the strength of the metal transversely in each case, and the steel weld proved to be twice as strong as the wrought iron. Bursting tests on wrought iron and steel butt welded pipe confirm these conclusions. The strength of the seams was compared by twisting pieces 8 feet long until they failed. The following results were obtained on three sizes of standard pipe, the appearance of the pieces after testing can be judged by Fig. 6.

Pipe steel finishes with a smoother surface than wrought iron, which for some purposes is very desirable.

A list of the physical properties of steel pipe would not be complete without referring to the exhaustive series of tests made on the National Tube Company's lap-weld steel pipe by Prof. R. T. Stewart, to determine the collapsing pressures. This work occupied one to six men four years and involved the collapsing of nearly four hundred pieces of pipe, 3 to 10 inches in diameter, mostly 20 feet in length.

Fig. 7 gives the collapsing pressure for all sizes and gages from 3 to 10 inches diameter, and for all lengths over six times the diameter. Further details may be had by reference to Prof. Stewart's papers in the transaction of the American Society of Mechanical Engineers for 1906[1]

Threading Pipe.

Steel pipe has been objected to by some, chiefly on account of the fact that it is somewhat harder to thread with the poor dies with which many threading shops are equipped, and which are too commonly sold to the trade. It is to be expected that a practically pure iron will offer more resistance to a blunt and improperly shaped die, than will a metal like puddled iron, in which are intermixed layers and strings of cinder amounting to 2 or 3 per cent. The power required to thread with a die shaped as shown diagrammatically in Fig. 8-A will be approximately proportional to the tenacity of the metal. By grinding the chasers as shown in Fig. 8-B or C and providing relief, so that the heel does not drag on the work, the difference in power required to thread iron and steel disappears and much better results are obtained with less wear and tear on the dies.

Considerable unnecessary trouble has been caused through die makers not recognizing the importance of these points, especially to the small operator depending on hand power. It may seem to some a rather elementary point to em-

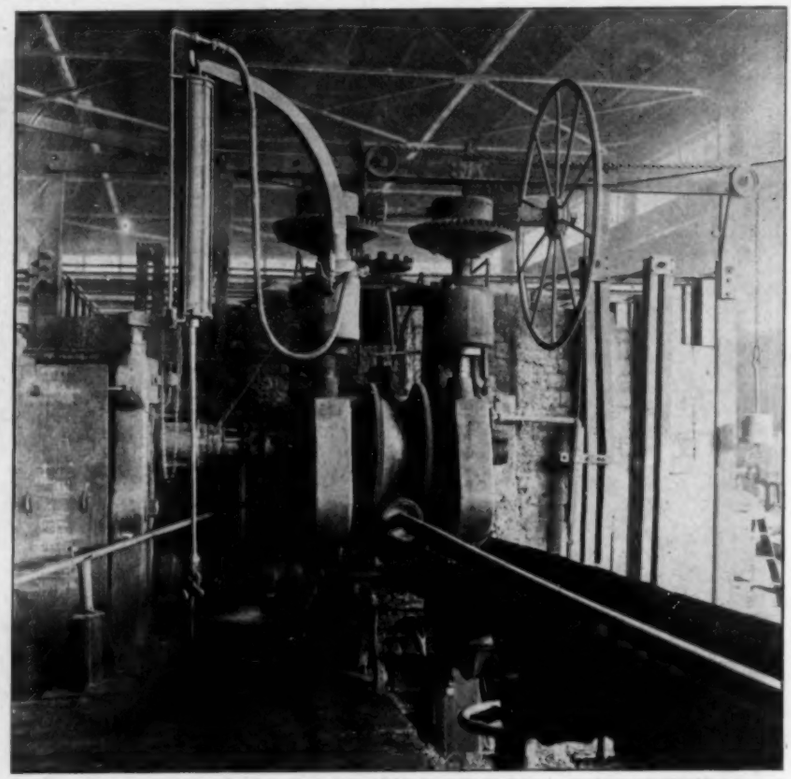


FIG. 4.—LAP-WELDING ROLLS.

TABLE I.
Twisting Tests on Butt-welded Pipe.*
SUMMARY.

Size inch.	Material	Make	Wt. per ft. lbs.	Variation from Card Wt. per cent.	Max. 3 foot Low	Pull on lever High	Lbs. av.	No. of turns in 6 ft. before failure	Per cent. failed in weld
⅛ inch	Steel	N. T. Co.	.816	—2.2	90	120	109	15	0
⅛ inch	Iron	1	.803	—4.2	40	98	68⅓	4½	73
⅛ inch	Iron	2	.792	—5.2	20	113	81	5¾	66
⅛ inch	Iron	3	.842	+0.6	50	85	65	2½	100
¾ inch	Steel	N. T. Co.	1.082	—2.9	160	185	172	8	13
¾ inch	Iron	1	1.079	—3.1	15	160	125	3¾	57
¾ inch	Iron	2	1.127	+1.0	80	176	136	3½	66
¾ inch	Iron	3	1.104	—1.0	50	160	107	2½	90
1 inch	Steel	N. T. Co.	1.658	—0.7	180	340	300	5½	13
1 inch	Iron	1	1.593	—4.4	220	292	256	4½	46
1 inch	Iron	2	1.616	—3.1	170	300	250	3 1-3	33
1 inch	Iron	3	1.620	—2.8	100	320	258	2¾	66

*From T. N. Thompson's paper—"Power required to Thread Twist and Split Wrought Iron and Weld Steel Pipes," before American Society of Heating and Ventilating Engineers, Jan., 1906.

[1]Reprinted in THE IRON TRADE REVIEW, June 14, 1906.

phasize, but we even now occasionally hear from large well equipped shops up to date with nearly all modern improvements, yet ten or fifteen years behind in their die equipment. It is not surprising that some have preferred wrought iron where much hand threading and cutting has to be done, as it is only within the past year or two that the much needed improvement has been introduced by certain makers of standard hand dies.

Corrosion of Iron and Steel.

This is a question which has brought forth many opinions, but in most cases with little practical evidence. After investigating closely many cases which have come under my observation during the past two years, where the two materials were put in service together and subject to the same conditions, I have never yet found any decided difference. The impression which exists in some minds that wrought iron pipe is much superior to steel in durability, may have originated in comparisons made years ago when the practice of making sound low carbon steel was probably not so well understood as it is today, or it may have been a mistaken identity for we frequently find iron mistaken for steel, especially if it happens for some cause or other to be pitted, but in most cases the idea has apparently been spread by hearsay and accepted without investigation.

In view of the inherent differences between iron and steel made for various uses, it would seem safer to compare each class by itself, i. e., wire, sheet, pipe, etc., each under the conditions of service to which they are subjected.

The essential conditions of corrosion, air, water and carbonic acid, are easily duplicated in the laboratory, but in practice corrosion is accelerated by presence of sulphurous and other solutions, stray electric currents, heat and numerous other influences difficult to trace.

It will be conceded that such conditions tending to seriously affect corrosion, are rapidly on the increase, especially in and near the great centers of population. Hence we should be slow to draw conclusions from the statement that steel does not last now-a-days as it did 15 or 20 years ago. Whatever was the relative standing of the two materials years ago (and opinions differ widely) what we are more concerned with is how do they stand today, and how can they be best protected from corrosion? Laboratory results, while open to criticism, as not truly representing actual conditions in the field, are valuable as indicating the relative standing of a number of samples under conditions known to be uniform—something difficult to be sure of in service tests. The writer has in his tests lately, used a 5 per cent hot solution of brine through which a continuous flow of air is pumped. One reason for adopting this solution is that a number of tests are on record which indicate that steel in general seems to be somewhat more susceptible to this environment than wrought iron, and further that the loss is quite considerable in a reasonable time (about 1-10 gram. per square inch per month). A number of average results on pipe materials are given in Table II, comparison being made with good wrought iron as a standard.

There are two possible ways of protecting steel; 1st, by use of efficient protective coatings; 2d, by treatment of the metal in the course of manufacture. Experiments have been under way for some time at the works of the National Tube Company with the object of increasing the durability of pipe steel. As a first step in this direction a process has been developed which after a year and a half's trial has given results showing a decided

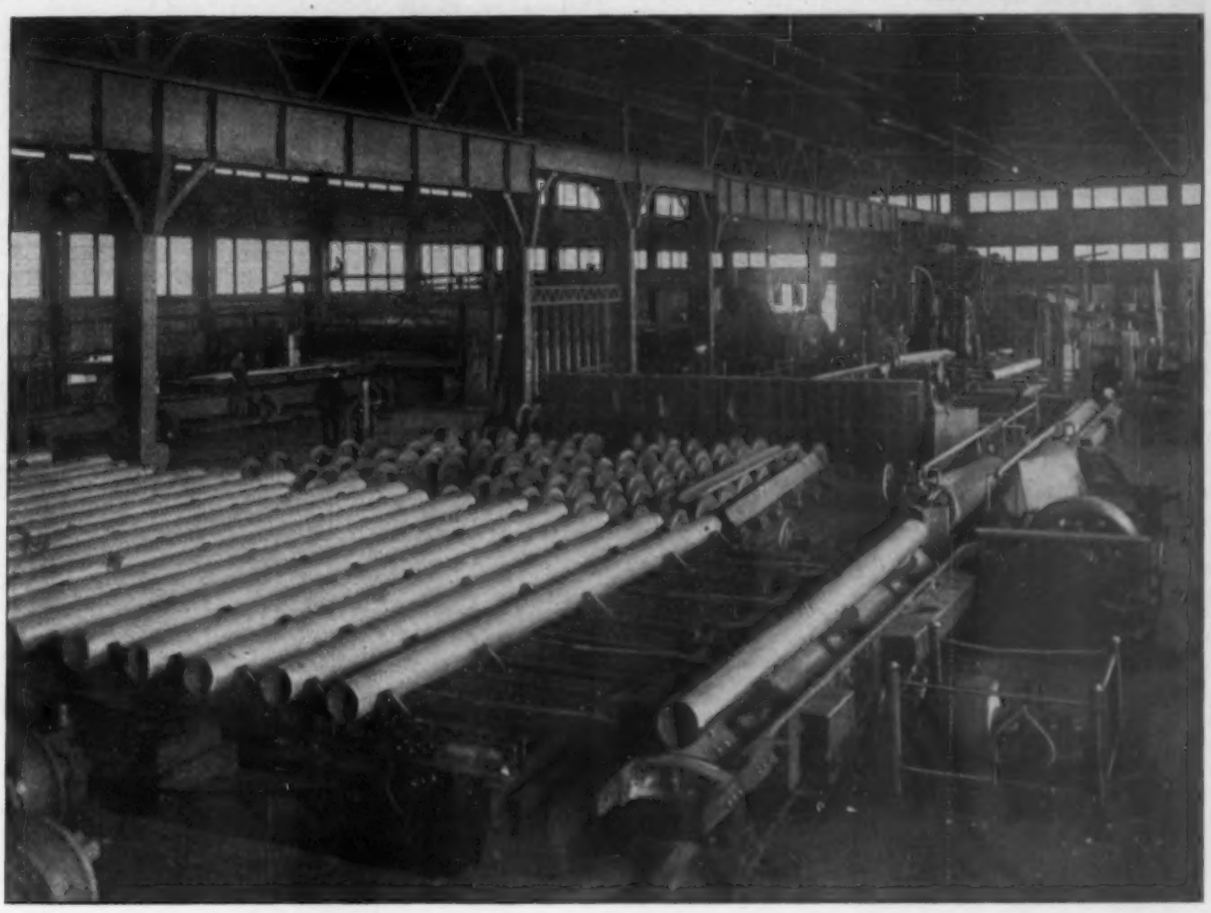


FIG. 5.—GENERAL ARRANGEMENT FINISHED END LAP-WELD FURNACE.

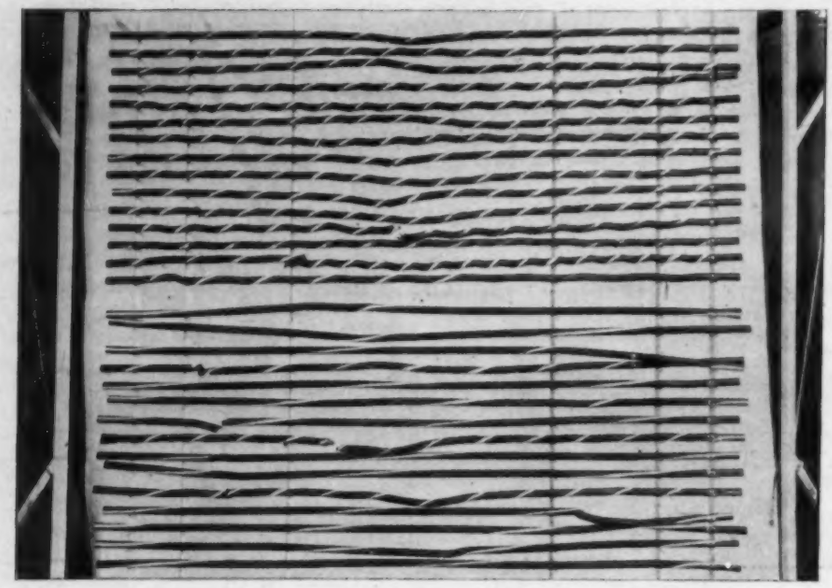


FIG. 6.—TWISTING TESTS.

benefit to the steel, especially in the uniformity with which it corrodes. The treatment consists in a mechanical working or kneading of the metal which tends to produce greater uniformity and improve the quality and texture of the steel. Doubtless much of the steel does not need this treatment, but in such cases it does no harm, and on the whole raises the average standard of the output. Tests marked No. 4, 5, and 6 were made on this steel.

It has been recognized that service tests must be made before any certain conclusion can be reached. A number of such tests have been made on this steel pipe in sulphurous air, salt water, and mine water during the past year, precautions being taken to have an equal number of pieces of "genuine" wrought iron pipe alongside under the same conditions. One or two tests which have been made in this way in sulphurous mine water are shown to illustrate the comparative uniform corrosion of the steel. The results so far have shown the steel so treated without exception to be at least the equal and generally decidedly superior to wrought iron.

TABLE II.

Average results of recent comparative tests on corrosion of wrought iron and pipe steel. (Losses per unit of surface exposed compared with puddled iron as 100.)

Conditions of Test	Authority.	Duration of Test	Charcoal Iron	Puddled Iron	Pipe Steel	Test Started
1. Aerated Distilled Water. Normal Temp.	U. S. Navy Dept.	64 weeks	100		94.5	1901
2. Sea Water Normal Temp.	H. M. Howe	2 years		100	119	1897
3. Aerated Brine. Normal Temp.	Lab'ry Nat'l Tube	6 months		100	106	1904
4. Aerated Water 180 deg. F.	Lab'ry Nat'l Tube	3 months		100	90.6	1905
5. Aerated Brine. 180 deg. F.	Lab'ry Nat'l Tube	3 months	80	100	75.3	1906
6. Aerated Sea Water. 180 deg. F.	Howe	3 months	94.4	100	94.2	1906

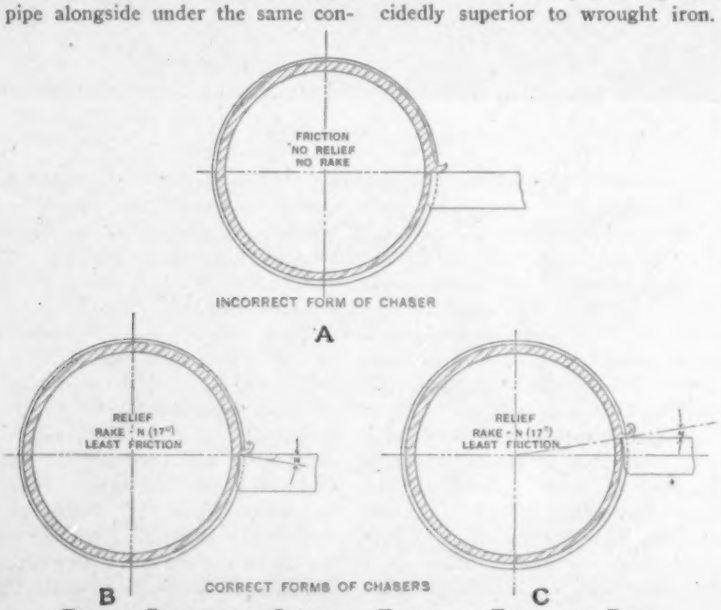


FIG. 7.—CORRECT AND INCORRECT FORMS OF THREADING DIE.

INCREASE OF MOISTURE IN COKE WHEN SHIPPED IN SEALED CARS.

The question of the increase of moisture in coke shipped in sealed cars has been brought up by the *Engineering and Mining Journal* through the publication of some correspondence between the general manager of the Pocahontas Coke Co. and another gentleman whom he has asked for advice upon the subject. It seems that the Pocahontas Coke Co. had found that coke shipped in box cars and by water to Mexico increased in moisture, in some cases, as high as 12 per cent of water. The conditions were such as to make it extremely improbable that the moisture had been absorbed from the air while in transit.

Mr. Page, to whom the correspondence was addressed by the Pocahontas Coke Co., replied that, in his opinion, the increase in moisture was due to chemical action. He presented an ingenious theory to explain this action which we give in his own words, as follows:

"My own theory is that in watering down the coke in the ovens, superheated steam passing through the cell structure of the coke finds enough iron to combine with the oxygen, leaving the hydrogen free, which is caught in the cells of the coke and partly sealed by the carbon glaze, and that later on this hydrogen is given off slowly. Two atoms of hydrogen and one of oxygen, as you probably know, make water (H_2O), but this chemical union is generally accompanied by an explosion. It is a well known fact in chemistry, however, that certain substances, such as platinum sponge and fresh carbon, will combine oxygen and hydrogen gases into water without an explosion, and when coke is sealed in a car, or hold of a vessel, it is reasonable to presume that, as the hydrogen is given off, it unites with the oxygen, in contact with the carbon of the coke.

"My experience, however, is that this trouble is most marked in hot weather, with freshly drawn coke, and with cokes that have the most glaze, such as Gauley Mountain and Connellsville. It is possible, however, that you may have the same trouble with Pocahontas coke (which, as a rule, is not glazed) in the

tight hold of a vessel. In your case, I would be inclined to look for the trouble elsewhere, either from contact with water from the ocean or from rains. If, however, you find the water is due to chemical action, the only remedy I can suggest is to keep the coke exposed to the atmosphere long enough to permit the escape of the hydrogen before shipment."

While the theory may not be correct, it at least opens the door to discussion. A thorough investigation of this subject

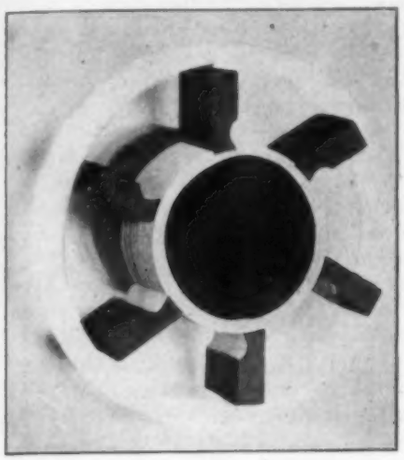


FIG. 8.—CHASERS PROPERLY GROUND FOR THREADING PIPE.

is not only desirable, but would doubtless prove extremely interesting.

NEW CANADIAN PLANT.

The Ontario Iron & Steel Co., which is erecting a plant at Welland, Ont., expects to start operations some time in May, and hopes to be running in all departments by June. At the present time three buildings are being erected besides carpenter and pattern shops, pattern storage sheds, transformer house, etc. The open-hearth building is 47 x 175 feet with a 35-ton overhead traveling crane running full length. This building will contain two 25-ton basic open-hearth furnaces. The steel casting foundry is 71 x 148 feet with a 53-foot lean-to on the one side and a 37-foot lean-to on the other side the full length of the building. The main building is covered by a 30-ton traveling crane with a 10-ton traveling crane in each lean-to. This structure is to contain two 20-ton melting furnaces, coke ovens and foundry machinery. The rolling mill is 64 x 300 feet with one 25-foot lean-to and one 35-foot lean-to the full length. The building proper is covered by a 10-ton traveling crane. The mill contains continuous heating furnaces for a 22-inch three-high mill driven by an electric motor, two reheating furnaces for a 12-inch three-high mill also driven by a motor. The

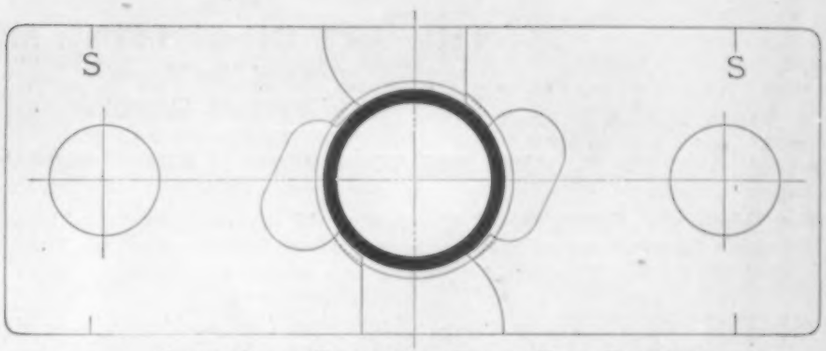


FIG. 9.—PROPER FORM OF PIPE DIE FOR HAND THREADING.

power for the entire plant is to be furnished by the Ontario Power Co., Niagara Falls, Ont. The fuel will be natural gas supplied from the company's own well located from two to seven miles from the plant. The production of the plant will be basic open-hearth ingots, billets, merchant bars, angles, rails, etc., and steel castings up to 15 tons weight. D. H. Blaney will be in charge of the open-hearth and foundry department. When the plant is running full blast it is expected that it will employ between 450 and 500 men.

The 36-inch blooming mill installed by the New York State Steel Co., Buffalo, was designed and built by the United Engineering & Foundry Co., Pittsburg. The pair of 48 x 60, direct-connected reversing engines for driving this mill and also the motor-driven vertical bloom shear, was installed by Mackintosh, Hemphill & Co., Pittsburg.

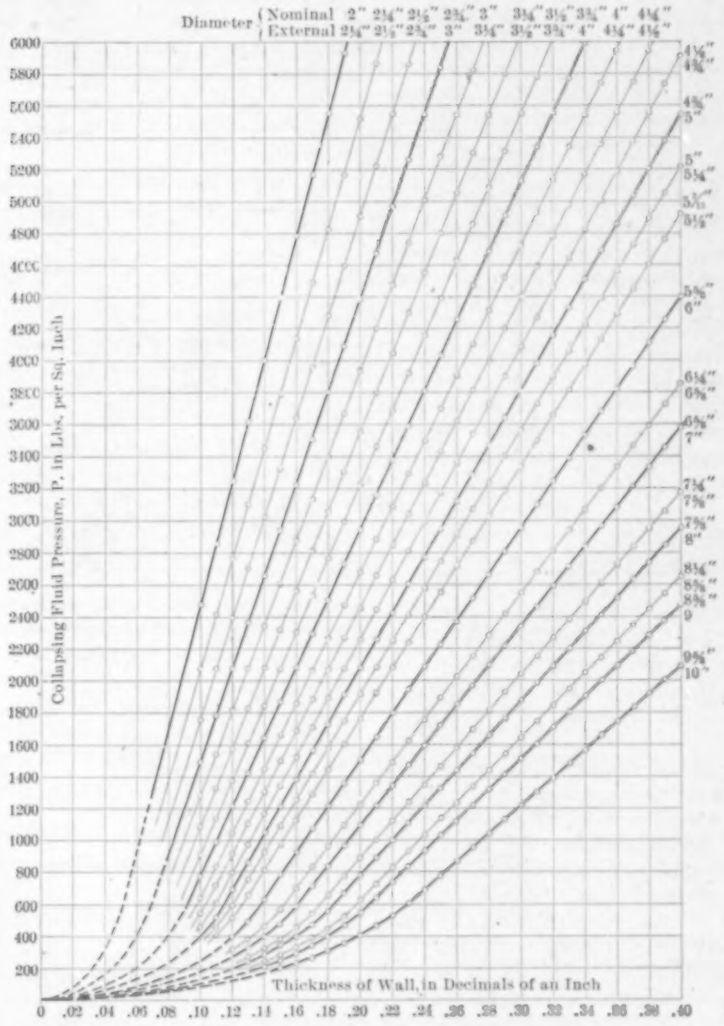


FIG. 10.—DIAGRAM OF COLLAPSING PRESSURES.

THE ART OF CUTTING METALS[1]

(Continued from last week.)

By Fred W. Taylor.

COOLING THE TOOL WITH A HEAVY STREAM OF WATER

Effect Upon the Cutting Speed of Pouring a Heavy Stream of Water Upon the Cutting Edge of the Tool.

Cooling the nose of a tool by throwing a heavy stream of water or other fluid directly upon the chip at the point where it is being removed by the tool from the steel forging enables the operator to increase his cutting speed about 40 per cent. The economy realized through this simple expedient is so large that it is a matter of the greatest surprise that experimenters on the art of cutting metals have entirely overlooked this source of gain. So far as the writer is aware, no experiments upon this subject have as yet been published. As already explained, in spite of the fact that the whole machine shop of the Midvale Steel Co. was especially designed as long ago as 1893 for the use of a heavy stream of water (super-saturated with soda to prevent rusting) upon each cutting tool, until very recently practically no other shops in this country have been similarly equipped.

When one appreciates the very small gain in cutting speed, amounting perhaps to from two to five per cent, attained by the many experiments which have been made upon the exact angles to which tools should be ground, and also the small practical results realized from experiments upon the pressure of the chip on the tool, and when one realizes the large amount of time and expensive apparatus entailed in these experiments; and, on the other hand, the extreme simplicity of making experiments on the effect of cooling the tool, and the 40 per cent of gain from this source, it is indeed a matter of wonder that this element has been entirely neglected.

The following are the important conclusions arrived at as to the effect on the cutting speed of cooling the tool with a heavy stream of water.

(A) In Table 79 are summarized the results of our experiments upon the gain in cutting speed through the use of a heavy stream of water on the tool in cutting different qualities of metals with varying types of tools, namely, modern high speed chromium-tungsten tools, heated to the melting point, the old-fashioned self-hardening tools, and carbon-tempered tools. The results obtained with modern high speed tools are the only ones of great practical interest at present, since no well managed machine shop would use any other than high speed cutting tools. The other data, however, are given as a matter of record and historic interest.

(B) With high speed tools a gain of 40 per cent can be made in cutting steel or wrought iron by throwing in the most advantageous manner a heavy stream of water upon the tool.

In designing slide rules or tables, etc., for assigning daily tasks to machinists a 33 per cent increase in cutting steel or wrought iron should be allowed for instead of 40 per cent, owing to the fact that workmen are more or less careless in directing the stream of water to the proper spot upon the tool.

(C) A heavy stream of water (3 gallons per minute) for a 2-inch by 2½-inch tool and a smaller quantity as the tool grows smaller, should be thrown directly upon the chip at the point where it is being removed from the forging by the tool. Water thrown upon any other part of the tool or the forging is much less efficient.

(D) The gain in cutting speed through the use of water on the tool is practically the same for all qualities of steel, from the softest to the hardest. (See Table 79).

(E) The percentage of gain in cutting speed through the use of water on the tool is practically the same whether thin or thick chips are being removed by the tool.

(F) With modern high speed tools a gain of 16 per cent can be made by throwing a heavy stream of water on the chip in cutting cast iron.

(G) To get the proper economy from the use of water in cooling the tool, the machine shop should be especially designed and the machine tools especially set with a view to the proper and convenient use of water.

(H) In cutting steel, the better the quality of tool steel, the greater the percentage of gain through the use of a heavy stream of water thrown directly upon the chip at the point where it is being removed from the forging by the tool. The gain for the different types of tools in cutting steel is:

a. Modern high speed tools, 40 per cent.

b. Old style self-hardening tools, 33 per cent.

c. Carbon tempered tools, 25 per cent.

This fact, stated in different form, is that: The hotter the nose of the tool becomes through the friction of the chip, the greater is the percentage of gain through the use of water on the tool.

The Portion of the Tool on Which the Water Jet Should be Thrown.

A series of experiments has demonstrated that water thrown directly upon the chip at the point where it is being removed from the forging by the tool will give higher cutting speeds than if used in any other way.

As another illustration of the small value to be attached to theories which have not been proved, we would cite the following: After deciding to try experiments upon the cooling effect of water when used upon a tool, it was our judgment that if a stream of water were thrown upward between the clearance flank of the tool and the forging itself in this way the water would reach almost to the cutting edge of the tool at the part where it most requires cooling, and that, by this means the maximum cooling effect of the water would be realized. We, therefore, arranged for a strong water jet to be thrown, as shown in Fig. 80, between the clearance flank of the tool and the flank of the forging, and made a series of experiments to determine the cooling effect of water with various feeds and depths of cut. So confident were we of the truth of this theory that we did not deem it worth while to experiment with throwing streams of water in any other way, until months afterward, when upon throwing a stream of water upon the chip directly at the point where it is being removed from the forging by the tool, we found a material increase in the cutting speed, and thus our first experiments were rendered valueless.

Practically, great difficulty will be found in getting machinists in the average shop to direct the stream of water on to the chip in the proper way as indicated in Fig. 81, because when a sufficiently heavy stream of water is thrown upon the work at this point it splashes much more than when thrown upon the forging just above the chip; and the machinists prefer slower cutting speeds and less splash. However, when they are managed under the "task system" with trained speed bosses who are accustomed to obeying orders, this trouble disappears.

Forty Per Cent Gain in Cutting Speed From Throwing a Heavy Stream of Water Upon the Tool in Cutting Steel.

It has been customary for many years to use under certain circumstances a

[1]Presidential address, A. S. M. E., 1906.

small trickling stream of water upon cutting tools (mostly on finishing tools, and with the object of giving the work what is called a "water finish"). For this purpose a small water can is generally mounted upon the saddle of the machine above the tool, and refilled from time to time by the machinist. Such streams of water, however, have little or no effect in increasing the cutting speed because they are too small in volume to appreciably cool the nose of the tool.

The most satisfactory results are obtained from a stream of water falling at rather slow velocity, but with large volume, at the proper point upon the tool; since a stream of this sort covers a larger area of the tool and is much freer from splash.

This water supply should be delivered through pipes fitted up with universal friction joints, so that the apparatus can be quickly adjusted to deliver the water at any desired point (the pipe being supported by a rigid bracket attached to the saddle of the lathe, preferably on the back side so as to be out of the way). In the case of short lathe beds the water supply can be delivered from overhead through a rubber hose, and in the case of long lathe beds through telescoping pipes attached to the saddle (smooth drawn brass pipes telescoping inside ordinary wrought iron pipes, with suitable stuffing boxes being used).

About three gallons of water per minute are required for adequately cooling a very large roughing tool, say two inches by two and one-half inches section; and proportionally smaller quantities as the tool grows smaller. For economy, the same water should be used over and over again, and it should be supersaturated with soda to prevent the machines from rusting.

Details of Typical Experiment for Determining Gain Through Heavy Stream of Water on the Tool.

The following is a detailed description of one of our series of experiments on the effect of water on the tool, made in this case for the purpose of determining the gain from the use of a heavy stream of water in cutting an exceedingly hard bar of metal, especially made and hammer hardened so as to be harder than hard steel of any of the qualities usually met with in machine shop practice. This experiment is given in detail as a type of our best method of experimenting in cases of this kind. The following are the physical tests and the chemical composition of the steel bar experimented upon. The experiment began Nov. 23, 1899, the physical properties being: Tensile strength, 102,270 pounds; elastic limit, 71,590 pounds; extension, 1.00 per cent; contraction, 0.75 per cent. The appearance of the fracture was crystalline. The composition was as follows: Carbon, 1.05; silicon, 0.147; manganese, 0.86; phosphorus, 0.027; sulphur, 0.034. This bar was hammer hardened.

Tools of the shape shown in Fig. 21 were made from tool steel of the follow-

TABLE 79.—EFFECT ON THE CUTTING SPEED OF A HEAVY STREAM OF WATER ON THE TOOL.

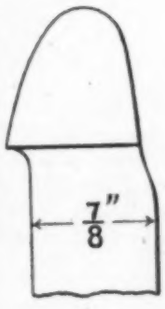
KIND OF TOOLS USED	QUALITY OF METAL BEING CUT, in all cases with depth of cut 3/16" feed 1/16											
	EXTRA HARD STEEL BAR HAMMER HARDENED SEE M* BELOW			MEDIUM MACHINERY STEEL SEE F BELOW			LOCOMOTIVE TIRE STEEL SEE L BELOW			HARD CAST IRON SEE C BELOW		
	CUTTING SPEED IN FEET PER MINUTE		PER CENT OF GAIN THROUGH USE OF WATER	CUTTING SPEED IN FEET PER MINUTE		PER CENT OF GAIN THROUGH USE OF WATER	CUTTING SPEED IN FEET PER MINUTE		PER CENT OF GAIN THROUGH USE OF WATER	CUTTING SPEED IN FEET PER MINUTE		PER CENT OF GAIN THROUGH USE OF WATER
HIGH SPEED CHROMIUM-TUNGSTEN TOOLS HEATED TO MELTING POINT	DRY	WATER ON TOOL		DRY	WATER ON TOOL		DRY	WATER ON TOOL		DRY	WATER ON TOOL	
TOOLS H [ANALYSIS GIVEN BELOW] TOOLS B [ANALYSIS GIVEN BELOW]	16	22.33	41	60	83	39				47	84'7"	16
OLD STYLE SELF-HARDENING TOOLS MIDVALE SELF-HARDENING TOOLS							19'3"	25'11"	32			
CARBON TEMPERED TOOLS CONTAINING 1.6% CHROMIUM							15'4"	19'3"	25			

*Bar M was made especially so as to be as hard as any steel ever likely to be met with in ordinary machine shop practice. It was so hard that a Mushet self-hardening tool would run only at a cutting speed of 4 to 6 feet per minute with 3/16" depth of cut and 1/16" feed

The following are the chemical and physical properties of the above test pieces

BAR	CARBON	MANGANESE	SILICON	PHOSPHORUS	SULPHUR		TENSILE STRENGTH	ELASTIC LIMIT	PERCENTAGE OF STRETCH	PERCENTAGE OF CONTRACTION
M	1.05	0.86	0.147	0.27	0.034		102,270	71,590	1.00	0.75
F	0.34	0.54	0.176	0.037	0.026		70,000	34,000	29.00	44.00
L	0.555	0.981	0.236	0.049	0.310		115,000	58,000	15.6	31.4
C	3.32 total 1.12 comb.	0.680	0.860	0.780	0.073					

CLEARANCE 6°
BACK SLOPE 8°
SIDE SLOPE 14°



The following are the chemical compositions of the tools above referred to

NUMBERS OF THE TOOLS		TUNGSTEN	CHROMIUM	CARBON	MANGANESE	SILICON	PHOSPHORUS	SULPHUR
26	TOOLS H	8.00	3.80	1.850	0.300	0.150		
2	TOOLS B	16.19	3.86	0.736	0.060	0.210		
70	MIDVALE SELF-HARDENING	7 723	1.83	1.143	0.180	0.248	0.023	0 009
84	CARBON TEMPERED		1.63	0.745	0 102	0.287	0.016	0 013

ing chemical composition, and were treated by the Taylor-White process (*i. e.*, heated to the melting point, cooled down, and reheated to 1,150 degrees in a lead bath):

Tungsten, 8.00; chromium, 3.90; carbon, 1.90; manganese, 0.30; silicon, 0.20; phosphorus, 0.025; sulphur, 0.030. These tools were marked respectively, V_1, V_2, U_3, U_4, U_5. They were then all standardized to prove their uniformity by being run at a cutting speed of 16 feet per minute, duration of cut 20 minutes, feed 1-16 inch, depth of cut, 3-16 inch. The ruining speed upon this forging of tools of this type had been previously proved to be between 16 and 17 feet per minute. The following are the details of the experiments with water:

TOOL NO.	MARK ON TOOL	CUTTING SPEED MINUTES.	DURATION OF CUT MINUTES	CONDITION OF TOOL AT END OF RUN
272 b	U_4	16	20	nearly ruined
273 b	U_3	16	20	fair
274 b	U_5	16	20	fair
275 b	V_2	16	less than 20	ruined*
276 b	V_1	14	less than 20	ruined*
277 b	V_2	14	less than 20	ruined*

*Tools V_1 and V_2 had evidently suffered considerably, due to their ruining tests while finding their proper speeds under water, and ought therefore to be left out of consideration. As the V_1 and V_2 tools had evidently been injured during their test with water, the results obtained were not taken in the average.

The following tests were made without the use of water on the second day of the experiments:

EXPERIMENTS WITH WATER

TEST NUMBER	MARK ON TOOL	CUTTING SPEED FEET	DURATION OF CUT MINUTES	CONDITION OF TOOL AT END OF RUN
256 b	V_1	19	20	fair
257 b	V_2	20	20	fair
258 b	U_3	21	20	fair
259 b	U_4	22	20	good
260 b	U_5	23	20	fair
261 b	V_1	24	2	ruined
262 b	U_3	23	1½	ruined
263 b	U_4	23	15½	ruined
264 b	V_2	22	7	ruined
265 b	U_5	22	20	nearly ruined
266 b	V_1	22	15	ruined
267 b	V_1	21	17½	ruined
268 b	V_2	21	20	nearly ruined
269 b	U_5	24	4	ruined
270 b	U_5	20	2¼	ruined
271 b	V_1	20	20	nearly ruined

From the list given above are below extracted those experiments that show the highest speed at which each tool endured 20 minutes and also the length of time it endured before ruining at one foot higher speed:

TEST NUMBER	MARK ON TOOL	CUTTING SPEED PER MINUTE, FEET	DURATION OF CUT MINUTES
271 b	V_1	20	20
267 b		21	17½
268 b	V_2	21	20
264 b		22	7
265 b	U_3	22	20
262 b		23	1½
259 b	U_4	22	20
263 b		23	15½
260 b	U_5	23	20
296 b		24	4

Experiments With Water.

In test No. 261 b tool V_1 had been ruined at a speed of 24 feet and thereby, as was afterward ascertained, suffered a marked deterioration. This accounts for the lower maximum speed at which it subsequently stood up.

In order to fully ascertain whether the ruining of these tools with water had any marked injurious effect upon them, the following tests were made without the use of water on the second day of the experiments:

The average cutting speeds of the U tools (all of which were proved to be uninjured) were as follows:

$$\frac{22 + 22 + 23}{3} = 22.33 \text{ feet,}$$

which divided by 16 feet gives 1.416:1.0 as the gain made by using water on the tool.

A similar experiment to the above was made upon a steel bar of about the following chemical composition and physical qualities and annealed at 1,300 degrees Fahr.:

Carbon, 0.34; manganese, 0.54; silicon, 0.176; sulphur, 0.026; phosphorus, 0.037; tensile strength, 70,000 pounds; elastic limit, 34,000 pounds; percentage of stretch, 29 per cent; percentage of contraction of area, 44 per cent.

Taylor-White tools similar to those described above, having been carefully standardized, showed a cutting speed when run without water of 60 feet per minute, and when run under a heavy stream of water of 83 feet, thus indicating a gain of 1.39:1.0 from the use of water. The average gain then through the use of water on the tool for hard and soft forgings is about 40 per cent.

Sixteen Per Cent Gain in Cutting Speed From Throwing Water Upon the Tool in Cutting Cast Iron

In 1906, after the writing of this paper was well under way, it occurred to us that we had accepted as true without verification through accurate experiments the fact that water could not be used in cutting cast iron. This is another of the many instances in which an absolutely erroneous opinion prevails throughout all of our machine shops without any foundation in fact.

To determine the effect of a heavy stream of water in cooling a tool cutting cast iron, experiments similar to those described above were made by us during the summer and fall of 1906 on a test piece consisting of exceedingly hard cast iron with cutting tools of three different chemical compositions.

The chemical composition of three of the latest high speed tools experimented with was that of tools Nos. 2, 5 and 7 of the following table:

Tool.	2	5	7
Year of Test.	1906.	1906.	1906.
Tungsten	16.19	14.23	14.91
Chromium	3.86	3.44	5.71
Carbon	0.736	0.739	0.790
Manganese	0.06	0.06	0.06
Silicon	0.210	0.165	0.060

The cast was of the following composition:

Total Carbon	3.32
Combined Carbon	1.12
Manganese	0.68
Silicon	0.86
Phosphorus	0.78
Sulphur	0.073

The following table represents the average gain made by these tools when they were run with a heavy stream of water as compared with running under exactly the same conditions dry. Depth of cut 3-16 inch, feed 1-16 inch, standard 20-minute cut; tools used, our standard ⅞ inch (shown in Fig. 21):

Cutting speed without water, 47 feet; cutting speed with heavy stream of water, 54 feet 7 inches; gain through use of water, 16 per cent.

Since writing the section of the paper covering the whole subject of the gain by cooling the tool with water, we have again met in our experiments with one of the strange anomalies which characterize the laws governing the art of cutting metals.

When the best of the modern high speed tools was run with a heavy stream of water in cutting a hard forging, later referred to, it was shown that instead of a gain of 41 per cent through the use of

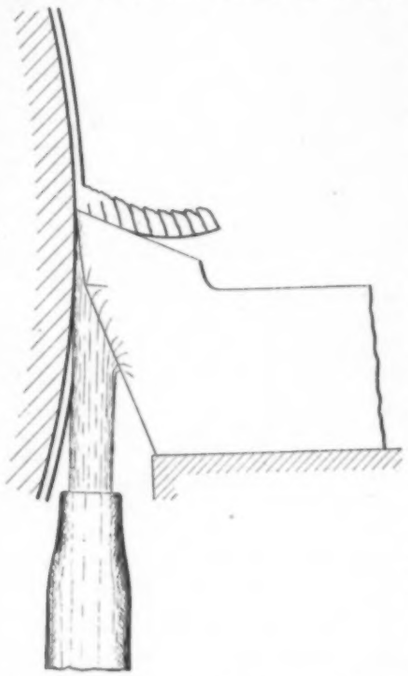


FIG. 80.—IMPROPER WAY TO THROW WATER ON A TOOL TO COOL IT.

water, as had been obtained with tools differing in their chemical composition, that there was a gain through the use of water of only 15 per cent. A lack of time prevented our going more fully into the effect of water upon high speed steels of the most modern composition with medium and soft forgings. It is, therefore, manifestly of the greatest importance to carry on thorough experiments in this field. Our experiments with tool No. 1 gave the following data: Depth of cut, 3-16 inch; feed, 1-16 inch; standard 20-minute cut; cutting speed without water, 41 ft. 5 in.; cutting speed with water, 47 ft. 8 in.; gain through use of water, 15 per cent.

The Percentage of Gain the Same Whether Thin or Thick Chips are Being Removed.

When in the Midvale Steel Works the gain in cutting speed through the use of water on the tool was discovered in 1884, a thorough investigation was made with varying depths of cut and thickness of feed—carbon tempered tools being used in cutting steel tires—and it was found that the percentage of gain in cutting speed through the use of water was the same whether the chips were thick or thin. These experiments have not been repeated by us with high speed tools, and it is possible that, owing to the very great difference in the heat of the high speed and the carbon tempered tools, there is a different ratio of gain for thick and thin chips with high speed tools. However, our slide rules have been in practical use in cutting chips of all degrees of thickness for years, using water on the tool, with the same ratio of increase in speed for thick and thin chips; and it would seem if any material difference exists between the gain in thick and thin chips, that this fact would have become evident through the failure of our slide rules to indicate the proper speeds. A careful experiment on this point is desirable.

In 1894-95 experiments were made with a carbon tempered tool containing 1.6 per cent chromium and with tools made from old-fashioned, self-hardening Midvale steel, of the following chemical composition: Carbon, 1.143; silicon, 0.246; phosphorus, 0.023; sulphur, 0.008; manganese, 0.180; chromium, 1.830; tungsten, 7.723.

The carbon tempered tools showed an average gain of 25 per cent in cutting a hard steel forging of the following physical and chemical properties: Tensile strength, 115,000 pounds; elastic limit, 58,000 pounds; stretch, 15.6 per cent; contraction of area, 31.4 per cent; carbon, 0.555; silicon, 0.236; phosphorus, 0.049; sulphur, 0.031; manganese, 0.981; copper, 0.058. The Mushet and Midvale self-hardening tools showed an average gain of 30 per cent in cutting the same forging. From these figures it will be noted that as the cutting speeds of tools grow higher, the percentage of gain through the use of water for cooling the tool grows greater. This would seem to be due to the fact that (taking the two extremes) the noses of the modern high speed tools are very much hotter under the great friction caused by the high speed of the chip than are the old-fashioned tempered tools with their slow speeds, and that therefore the water acts in a considerably more efficient manner in cooling the high speed tools than the slow speed tools.

CHATTER OF THE TOOL.

Chatter Caused by the Nature of the Work.

(A) Chatter is the most obscure and delicate of all problems facing the machinist, and in the case of castings and forgings of miscellaneous shapes probably no rules or formulæ can be devised which will accurately guide the machinist in taking the maximum cuts and speeds possible without producing chatter.

(B) It is economical to use a steady rest in turning any piece of cylindrical work whose length is more than twelve times its diameter.

Chatter Caused by the Method of Driving the Work.

(C) Too small lathe-dogs or clamps or an imperfect bearing at the points at which the clamps are driven by the face plate produce vibration.

Chatter Caused by Cutting Tools.

(D) To avoid chatter, tools should have cutting edges with curved outlines and the radius of curvature of the cutting edge should be small in proportion as the work to be operated on is small. The reason for this is that the tendency to chatter is much greater when the chip is uniform in thickness throughout, and that tools with curved cutting edges produce chips which vary in thickness, while

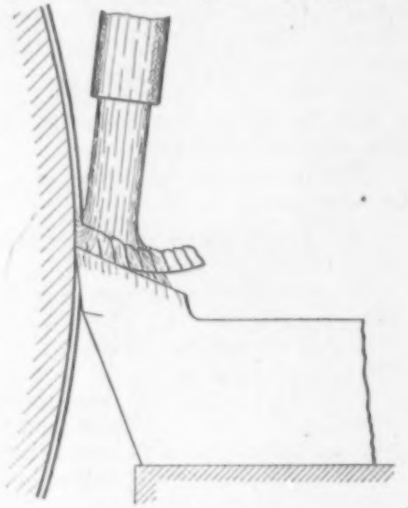


FIG. 8.—PROPER WAY TO THROW WATER ON TOOL TO COOL IT.

those with straight cutting edges produce chips uniform in thickness.

(E) Chatter can be avoided, even in tools with straight cutting edges by using two or more tools at the same time in the same machine.

(F) The bottom of the tool should have a true, solid bearing on the tool support which should extend forward almost directly beneath the cutting edge.

(G) The body of the tool should be greater in depth than its width.

Chatter Connected with the Design of the Machine.

Chatter caused by modifications in the machine may be classified as follows:

(H) It is sometimes caused by badly made or fitted gears.

(J) Shafts may be too small in diameter or too great in length.

(K) Loose fits in the bearings and slides may occasion chatter.

(L) In order to absorb vibrations

caused by high speeds, machine parts should be massive far beyond the metal required for strength.

The Effect of Chatter Upon the Cutting Speed of the Tool.

(M) Chatter of the tool necessitates cutting speeds from 10 to 15 per cent slower than those taken without chatter, whether tools are run with or without water.

(N) Higher cutting speed can be used with an intermittent cut than with a steady cut.

Of all the difficulties met with by a machinist in cutting metals, the causes for the chatter of the tool are perhaps the most obscure and difficult to ascertain, and in many cases the remedy is only to be found after trying (almost at random) half a dozen expedients.

This paper is chiefly concerned with chatter as it is produced or modified by the cutting tool itself. Some of the other causes for chatter, however, may be briefly referred to. These may be divided into five groups:

(A) The design of the machine.

(B) The nature and proportions of the work being operated upon.

(C) The care and adjustment of the parts of the machine.

(D) The method of setting the work in the machine or of driving it.

(E) The shape of the cutting tools, manner in which they are set in the machine and the speeds at which they are run.

Causes (A) and (B) are outside the control of the machinist. Elements (C), (D) and (E) are or should be to a large extent under the control of the management of the shop.

(A) Referring, now, to cause (A), "The design of the machine," the chief elements causing chatter in the design of a machine are:

(*a*) Gears which are set out of proper adjustment or the teeth of which are untrue. It should be noted that involute teeth will run smoothly whether their pitch diameters exactly coincide or not, whereas epicycloidal teeth are almost sure to rattle unless their pitch lines are maintained in their exact proper relations one to the other.

(*b*) Chatter is frequently caused through mounting the driving gears upon shafts which are either too small in diameter or too long. A large excess in the diameter of shafts beyond that required for strength is called for in order to avoid torsional deflection which produces chatter.

(*c*) Lathe shafts and spindles must, of course, be very accurately and closely fitted in their bearings, and the caps adjusted so as to avoid all play.

(*d*) For heavy work the lathe tail stocks should be fastened to the bed plates with bolts of very large diameter, and should be tightened down with long handled wrenches.

(*e*) The lathe bed itself should be exceedingly massive, and should contain far more metal than is required for strength or even to resist ordinary deflections; and the moving tool supports should also be heavy far beyond what is required for strength.

Massive Machines Needed for High Speeds.

Undoubtedly high cutting speeds tend far more than slow speeds toward producing minute and rapid vibrations in all parts of the machine, and these vibrations are best opposed and absorbed by having large masses of metal supporting the cutting tool and the head and tail stocks. It is largely for the purpose of avoiding vibration and chatter in machines that the high cutting speeds accompanying the modern high speed tools call for a redesigning of our machine tools. While it is true that in many cases a very great gain can be made by merely speeding up a machine originally designed for slow speed tools, this increase in speed almost invariably produces a corresponding increase in the vibration or chatter, and for absorbing this, the lathes and machines of older design are, in many cases, too light throughout.

(C) Cause (C) namely, "The care and proper adjustment of the various parts of the machine," is almost entirely under the control of the shop management. It is, of course, evident that so far as the effect of chatter is concerned, one of the most important causes can be eliminated from the shop by systematically looking after the careful adjustment of all of the working parts of the machine to see that the caps of the bearings are always so adjusted as to have no lost motion and yet not bind, and so that all gibs and wedges for taking up wear upon the various slides are kept adjusted to a snug fit. It is our experience, however, that the adjustment of the various parts of the machine should in no case be left to the machinist who runs his lathe, but that the adjustment and care of machines should be attended to systematically and at regular intervals by the management. In large shops a repair boss with one or two men can be profitably kept steadily occupied with this work. A tickler, however, should be used for reminding the repair boss each day of the adjustment of machines and the overhauling which should be attended to on that day.

(D) Cause (D), namely, "The method of setting the work in the machine or of driving it," is in many cases capable of being directly under the control of the machinist.

(*a*) One of the most frequent causes for chatter lies either in having too light or too springy clamps or lathe dogs fastened to the work for the purpose of driving it, or in having vibration at the point of contact between the lathe dog, and the face plate of the lathe, or the driving bracket which is clamped to it. In heavy work the clamps should be driven at two points on opposite sides of the face plate, and great care should be taken to insure a uniform bearing of the clamps at both of these driving points. Chatter through vibration at this point can frequently be stopped by inserting a piece of leather or thick lead between the clamps and the driving brackets on the face plate; which has the effect both of deadening the vibration and equalizing the pressure between the two outside diameters at which the clamp is driven by the face plate.

(*b*) A dead center badly adjusted so as to be either too tight or too loose on the center of the work, or any lost motion in the tail stock of the lathe is such an evident source of chatter that it need not be dwelt upon.

(E) Cause (E), namely, "The shape of the cutting tools, the manner in which they are set in the machine and the speeds at which they are run." We have attempted to explain the effect of a uniform thickness of chip in causing chatter, and have indicated that the proper remedy for this is to use a round-nosed tool, which is always accompanied by a chip of uneven thickness. We have also referred to the desirability of having the body of tools deeper than their width in order to insure strength, as well as to diminish the downward deflection of the tool, which frequently results in chatter, particularly when the tools are set with a considerable overhang beyond their bearing in the tool post.

We have also called attention to the great desirability of designing tools with their bottom surfaces extending out almost directly beneath the cutting edge, and of truing up the bottom surface of the tools, so as to have a good bearing directly beneath the nose of the tool on the tool support. If sufficient care is taken in the smith shop and the smith is supplied with a proper surface plate, the tools can be dressed so as to be sufficiently true on their bottom surfaces for all ordinary lathe work.

It has been the necessity for avoidance of chatter which has influenced us greatly in the adoption of round-nosed tools as our standard. Tools with straight cutting edges, which remove chips uniform throughout in thickness can be run at very much higher cutting speeds than our standard round-nosed tools; but owing to the danger of chatter from these tools, their use is greatly limited, in fact,

almost restricted to those special cases in which chatter is least likely to occur. Attention should be called, however, to a method by which straight edge tools have been used successfully for many years upon work with which there was a very marked tendency to chatter.

While at the works of the Midvale Steel Co. we superintended the design of a large lathe for rough turning gun tubes and long steel shafts; in which tools with long straight cutting edges were used without chatter, and yet at the high speeds corresponding to the thin chips which accompany this type of tool. This lathe was designed with saddle and tool posts of special construction, so that two independently adjustable tool supports were mounted on the front side of the lathe and one on the back side. In each of these slides a heavy straight edge tool was clamped. The three tools were then adjusted so that they all three removed layers of metal of about equal thickness from the forging, and, although the tendency toward chatter,—owing to the uniform thickness of the chip, was doubtless as great with these straight edge tools as with any others, the period of maximum or of minimum pressure for all three tools never corresponded or synchronized so that when one tool was under maximum pressure, one of the others was likely to be under minimum pressure. For this reason the total pressure of the chip on all three tools remained approximately uniform and chatter from this cause was avoided.

(B) Cause (B), namely, "The nature and proportions of the work being operated upon." In assigning daily tasks to each machinist with the help of our slide rules, the element which still continues to give the greatest trouble to the men who write out these instructions is deciding just how heavy a cut can be taken on the lighter and less rigid classes of work without causing chatter. This branch of the art of cutting metals has received less careful and scientific study than perhaps any other. While the element is one which must always remain m. or less under the domain of "rule of thumb," since the causes which produce chatter, particularly in castings of irregular shapes, are so many and complicated as to render improbable their successful reduction to general laws or formulae, undoubtedly much can be done toward attaining a more exact knowledge of this subject, and experiments in this line present a most important field of investigation.

The following rule (belonging to the order of "rule of thumb") which has been adopted by us after much careful and systematic observation, extends over work both large and small, and covers a wide range:

It is Economical to Use a Steady Rest in Turning any Piece of Metal Whose Length is More Than Twelve Times its Diameter.

When the length of a piece becomes greater than 12 times its diameter, it is necessary to reduce the size of the cut to such an extent that more time will be lost through being obliged to use a light cut than is required to properly adjust a steady rest for supporting the piece.

There is one cause for chatter which would seem to be impossible to foresee and to guard against in advance, *i. e.*, chatter which is produced by a combination of two or more of the several elements likely to cause chatter. If, for instance, the natural periods for vibration in the tool and in the work or in any of the parts of the lathe and the work happen to coincide or synchronize, then chatter is almost sure to follow; and the only remedy for this form of chatter seems to lie in a complete change of cutting conditions; a change, for instance, to a coarser feed with an accompanying slower cutting speed, or vice versa. Unfortunately, for economy, higher speeds rather than slow speeds, tend to produce this type of chatter, and the remedy therefore generally involves a slower cutting speed.

The Effect of Chatter Upon the Cutting Speed.

A tool which chatters to any great extent must be run at a rather slower cutting speed than a tool which runs free from chatter, as will be seen by the following carefully tried experiment:

A forging, 14 feet long, 4⅝ inches diameter, made of exceedingly hard steel which was especially hammer hardened and uniform, was placed in the lathe, and standard cuts 3-16 inch depth, and 1-16 inch feed (with our standard round-nosed tool ⅞ inch) were taken upon it in such a way that they first ran smoothly without chattering; other cuts were then taken in such a position on the forging that the tool chattered badly throughout its cut. This was accomplished by using a steady rest in one case so as to prevent chatter, and in the other case running without the steady rest. All of the tools had been carefully standardized before starting the experiments, and proved uniform and capable of running at maximum cutting speeds. The forging had also been proved uniform, and its standard cutting speed had been shown to be between 15½ and 16 feet per minute.

In the two tables below are given the details of the cutting speeds obtained with and without chatter. In one of these experiments the tool was run without water and in the other the tool was cooled through the use of a heavy stream of water.

The following experiments show that chatter causes a reduction in cutting speed of 10 per cent to 15 per cent, whether the tools are run with or without water to cool them.

Chatter causes reduction 10 to 15 per cent in cutting speed:

No Water on the Tool.

Test No.	Mark on tool.	Cutting speed ft. in.	Duration of cut. min.	Condition of tool at end of run.	Whether tool chattered or not.
124 b	U_a	15	20	good	no chatter
125 b	U_a	17 6	14½	ruined	no chatter
126 b	U_a	15	4¾	ruined	chattered badly
127 b	U_a	15	9¾	ruined	chattered badly

Water on the Tool.

Test No.	Mark on tool.	Cutting speed ft. in.	Duration of cut. min.	Condition of tool at end of run.	Whether tool chattered or not.
128 b	U_m	19	5¼	ruined	chattered badly
129 b	U_m	19	20	fair	no chatter

Experiment No. 125b was made for the purpose of again showing conclusively that both the tool and the forging had been properly standardized. It will be noted that this tool, free from chatter, broke down in 14½ minutes at a cutting speed of 17 feet 6 inches, whereas the tool just above it ran all right for 15 feet at 20 minutes, showing that both the forging and tools had been properly standardized.

Accurate experiments on the chatter of the tool are difficult to make because the comparatively small diameter of work which is needed to insure chatter calls for an extremely hard piece of metal (*i. e.*, slow cutting speeds) in order to make the runs, which must last for 20 minutes, extend through a sufficiently short distance over the length of the forging so that the tools shall not be in danger of chattering. It was for this reason that we were obliged to make the above forging out of extremely hard metal.

Higher Cutting Speed Can be Used With an Intermittent Cut Than With a Steady Cut.

An intermittent cut, however, has a very different effect upon cutting speed from that produced by chatter. We have observed in a large number of cases that when a tool is used in cutting steel with a heavy stream of water on it (and this is the proper method of cutting steel of all qualities), a rather higher cutting speed can be used with an intermittent cut than with a steady one. The reason for this is that during that portion of the time when the tool is not cutting,

the water runs directly on those portions of the lip surface and cutting edge of the tool which do the work and for this reason the tool is more effectively cooled with intermittent work than with steady work. As an example of intermittent work, the writer would cite:

a. Cutting the outside diameter of a steel gear wheel casting, in which case the tool is only one-half its time under cut.

b. Or turning small pieces of metal which are greatly eccentric.

c. Or, for example, all planer and shaper work which is not too long.

It would seem from a theoretical standpoint that a tool would be greatly damaged (and therefore a slow cutting speed would be called for) by the constant series of blows which its cutting edge receives through intermittent work. It will be remembered, however, that in planer work (and this class of intermittent work comes to the direct attention of every machinist) the tool is more frequently injured while dragging backward on the reverse stroke of the planer than it is while cutting, and it is very seldom that a tool is damaged as it starts to cut on its forward stroke. In all cases, however, where the tool deflects very greatly, when it starts its cut on intermittent work slower speeds are called for than would be required for steady work.

The above remarks on intermittent work do not, of course, apply to cast iron with a hard scale or the surface of which is gritty. It is evident that in all such cases owing to the abrasive action of the sand or scale on the tool, intermittent work is much more severe upon the tool than a steady cut.

(To be continued.)

Alexander E. Outerbridge Jr., Philadelphia, has secured a United States patent on his process of adding ferrosilicon to cast iron in the ladle. The process was described in the IRON TRADE REVIEW on June 7, 1906:

REPAIRS TO STEEL FREIGHT CARS.[1]

By J. F. MACENULTY.[2]

Some early designs of steel cars were gotten up in competition with wooden-car weights which then existed, and the argument that a great ratio of paying load to dead weight was to be had sold a great many cars. As a consequence, many cars were designed that were really too light for the exceptionally heavy service. Today, however, the weight of the car up to a certain point, is not considered; for instance, 50-ton cars for general service weighed, in 1902, 35,000 pounds; today the same capacity cars weigh 45,000 pounds, or an increase in dead weight of 10,000 pounds in four years. The questions now are. Will the car stand the severe buffing shocks? Will it keep off the repair track? Railroads now realize that a car continually in service more than pays for the hauling of its dead weight by an increased number of loads. For roads where service is not so heavy, a car with great ratio of paying load to dead weight can be used to advantage.

The first steel cars were built almost entirely of pressed shapes; then other manufacturers designed cars to be built entirely of structural shapes. Today, the builders of so-called "structural cars" use pressed shapes and structural shapes, and pressed shapes were used where, in the mind of the designer, they are most feasible. The days of light construction are over. Where ten years ago an 80,000-pound capacity car was considered unusual, the 100,000-pound car is now common, and the railroads look for a greater capacity. The time will come when many of us will see trains of cars each unit carrying 150,000 pounds or over. In fact, today this matter is being seriously consid-

FIG. 1.—TYPE OF CAR WHICH WAS WRECKED.

FIG. 2.—WRECK OF STEEL FREIGHT CAR.

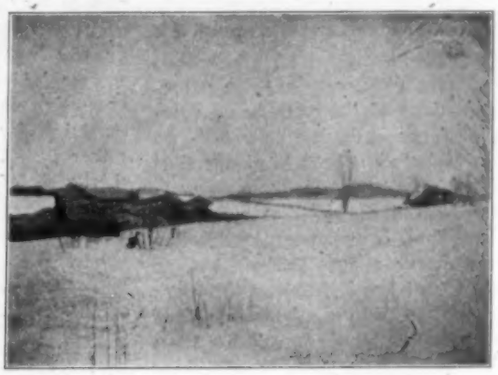


FIG. 3.—WRECK OF STEEL FREIGHT CAR.

ered by at least one leading road. True, there are many such cars now, but they are made for special use.

As shown by the records of nine representative car-building companies in the year 1905, there were 224,817 cars ordered; of these 148,493 were steel and 76,324 wood. With steel cars coming so rapidly to the front, the question of repairs is a very live one. In repairing steel cars a road which has none in service usually resorts to the use of skilled labor or returns the cars to the builder; either method is

[1] A paper read before the New England Railroad Club.

[2] Pressed Steel Car Co., Pittsburg.

costly, and is apt to prejudice the managements decision when the question of steel vs. wood construction is brought up. There is absolutely no need that any railroad large or small should employ skilled labor or return steel cars to the manufacturer. Skilled labor is not used at shops where cars are built; then why use skilled labor to repair them? When a car is new, naturally the question of appearance and finish is one of the important points of inspection. When a car is out of service the question of utility is uppermost, and repairs should be made in the cheapest manner consistent with good service. Why pay boiler-makers' prices to have a perfectly finished rivet driven, when a laborer at half the pay will drive one that will perform its office satisfactorily in half the time? A little experience with the rough-and-ready car repairer vs. slow skilled labor is usually convincing. Railroads are now using the same repair gangs for both wood and steel cars. If the car foreman lacks the ingenuity or confidence to make the necessary repairs, send him to Altoona, Mt. Clare or Collinwood, where they are past masters in the art. Unless his natural prejudice has overcome his mental balance, the expense of his trip will be repaid many times.

In the early days of repairs to steel cars, it was the custom when a sill was bent to dismember the car and take the piece out to straighten it. Now, an oil furnace of a charcoal fire is put under the car, and when the sill is heated sufficiently it is put back into shape by a pulling jack applied to suit conditions. When sills are broken, a splice can be made by making a butt joint with plates on inside and outside, all securely riveted.

Steel cars received on repair tracks on account of wrecks seldom have any of the frame or body lost, so it is simply a matter of cutting off the bent small parts, straightening them and riveting them in place. It is, however, advisable when purchasing new cars to order a small supply of steel shapes that will most likely be needed for running repairs. This saves time and inconvenience, for no matter what argument may be put forth about having shapes, etc., in the open market, when the time comes for such purchase it will be found hard to get immediate delivery, and harder still to shape material for application to cars. On the average road there is not enough demand for repair parts to warrant the expense of putting up a special shop, this condition makes it necessary to look to the builders for material, whether it be of structural or pressed shapes. Pressed members and structural members, such as end and corner posts, stakes, flange angles and plates, can be cut off by hand and heated in a gas or oil fire and straightened on a large flat surface plate or anvil with ordinary blacksmith's tools. One gang of men at this forge can take care of this class of work for a large number of cars. Heating and bending will not injure the steel used in construction of cars, so that practically all the parts removed from a steel car can be utilized either in their original shape or as patches on some other part.

It must be remembered that shocks and treatment that would ordinarily destroy a wooden car merely make the steel car an object that draws the anathemas of the wrecking crew and the solicitous consideration of the repair gang. Gone is the inevitable bonfire that was a simple method of clearing up the debris. The alternative now is either to bury the car or send it to the repair tracks; it won't burn. Heavier and more powerful cranes are necessary, but the right of way is more easily and quickly cleared. When a chain is put around a corner-post or sill, the whole car moves, not merely a section as heretofore. There is a record of steel cars wrecked that could not be repaired. They rolled over a 200-foot embankment into a swollen river and were carried about two miles from the railroad. It was impracticable to tow them back. Aside from a few similar instances, there is no record of a steel car being wrecked in such a manner that the cost of repairs would make it advisable to scrap it.

The cost of steel car repairs is, on the whole, small by comparison with wooden car repairs, when it is taken into consideration that comparative costs of repairs of the two types as given by railroads are as a rule manifestly unfair. The maintenance reports given for publication are generally taken only for cars that have been repaired. When it is a wood car this means, on an average, slight repairs. But what of the wood cars de-

FIG. 4.—WRECKED STEEL FREIGHT CAR ON LAKE CHAMPLAIN & MOUNT MORIAH R. R.

FIGS. 5-8.—WRECKED FREIGHT CARS ON LAKE CHAMPLAIN & MOUNT MORIAH R. R.

stroyed? There are thousands of such every month. Should not the cost of renewals, less a scrap credit, be added to the wood-car maintenance sheet to arrive at a fair basis for comparison with the steel cars. This would throw a great balance in favor of the steel car. It, however, would bring forth the argument that many of the wood cars thus destroyed were old and of an obsolete type. While this is true, yet the old car has a money value; a car is a car on the records, and the failure of the old wood cars serves only to enhance the value of the up-to-date steel car that will not disintegrate.

The average cost of repairing steel cars varies considerably with the type, and as a larger number of 100,000-pound steel hoppers have been built than any other class, cost of their repairs would be more interesting. The following is a record of average costs of certain kinds of repairs to this type, not including the trucks:

COST OF REPAIRING 100,000-POUND CAPACITY STEEL HOPPERS.

One end having side and end sills, draft sills and corner braces and brackets badly bent	$ 36.50
Both ends damaged as above and body badly sprung	85.75
To cut entire frame and body apart and re-rivet	140.00
A steel car having been in a wreck that would totally destroy the body and frame of a wooden car can be repaired as good as new, for	50.00
A steel hopper so badly wrecked that scrapping it was considered, was repaired good, for	160.00

This is the labor charge of cutting off the bent parts, straightening and re-riveting in place; the only new material used being rivets.

These figures are from railroad systems using over 100,000 steel cars, some of them having been in service from seven to eight years. They estimate that the cost of car maintenance is reduced 35 per cent, and stock for repairs 50 per cent, by use of all-steel construction, taking an equal number of cars of both types as a basis.

As regards care of cars, while some roads do not consider it necessary to repaint their steel freight equipment, yet "An ounce of prevention is worth a pound of cure," is here applicable. Any metal surface exposed to the elements is better for a little attention, and on any other structure it would be considered a necessity. At a prominent repair point, where 500 cars a month are repainted, the average cost of gondola or hopper cars, not including the trucks, is as follows:

Sand blasting	$0.45
Paint for body and lettering	6.00
Labor for body and lettering (according to locality)	$10.00 to 2.00

As an illustration of what a steel car will stand a number of photographs of wrecked 100,000-pound standard ore cars are shown herewith. These cars, each containing 50 tons of ore, ran three miles down a four per cent grade on the Lake Champlain & Moriah, an ore road in the northeastern part of New York, and with the engine jumped over the end of a switchback, the cars and engine going through the air 422 feet before striking the ground; the point of contact was frozen ground, the drop being 53 feet from the track level. The engine and cars then rolled 516 feet. These seven cars originally cost about $1,200 each. The cost of repairs averaged $690 each, which was the manufacturer's cost, and included ten per cent profit and an operating and administration expense that on a railroad, would be largely taken care of in other operations, and not charged entirely to cars, as is necessary for a car builder. A large part of the cost was in the trucks, owing to the peculiar nature of the wreck. Eliminating the trucks, the repairs to the bodies cost only $350 each. In repairs to trucks alone, it was necessary to replace 17,700 pounds of steel, 56 journal boxes and lids, 54 brake shoes, 56 journal bearings and wedges, 28 groups of springs, 20 axles, 25 wheels, 1,200 pounds of forgings and 3,900 pounds of castings, or a total of 68,800 pounds of material. A wooden car under similar conditions would have been good only for firewood and a small scrap credit for truss rods, grab iron, etc. This wreck for a small number of cars represents about as severe a condition as could be met, and shows that a steel car is always good enough to be repaired.

There are also shown two photographs which illustrate a steel passenger car that was in an accident. The flat car on which it was loaded jumped the rack and overturned, carrying the passenger car with it. The first illustration shows the underframe construction and the corrugated sheets under the monolith floor; the second photograph shows the car after being righted. The only damages sustained were a few broken windows and scratched varnish. A wooden car under similar conditions would have been badly damaged.

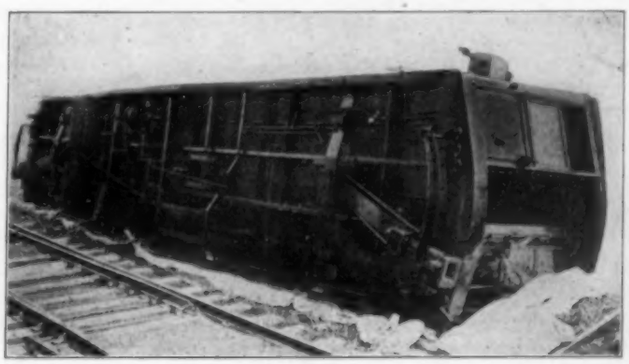


FIG. 9.—WRECK OF STEEL PASSENGER CAR.

FIG. 10.—STEEL PASSENGER CAR AFTER RIGHTING.

The World's Production of Spelter.—The world's production of spelter in 1906 is given in statistics compiled by Henry R. Merton & Co., Ltd., London. The total production was 688,300 gross tons, compared with 647,720 tons in 1905 and 615,290 tons in 1904. The total production for the United States in 1906 was 196,245 tons. Europe produced 491,045 tons. The country producing the largest amount was Germany, which comprises the Rhine district and Silesia, the total being 201,795 tons.

The Illinois Traction system has awarded the contract to the Danville Car Co., Danville, Ill., for $200,000 worth of new equipment, including six electric locomotives, 30 interurban cars, 20 express trailers and 12 city cars.

LABOR: PREMIUM SYSTEM.[1]

By F. E. Webner.[2]

Without taking the time and space to discuss the advisability of the adoption of a premium system, let us assume that the expense prerequisite to the introduction of such a plan is going to be a means to a good end, and that the volume of product will be very materially increased with a marked decrease in percentage of burden; for, with a scientifically devised and installed premium system, that is just what will be brought about and the force of employes will eventually be, in the main, a happy and contented lot by reason of their earnest efforts and increased earnings. That there will be organized opposition at first is a foregone conclusion. Labor unions are unfavorable to it and will put stumbling blocks in the way wherever possible.

The first step in the introduction of a premium system is the organization of a rate fixing board to determine all time allowances; such allowances are usually based on past experience where the data thereof are available and, if not, then estimates must be resorted to. As the prime essential in a premium system is the saving of time, the time allowance should not be too liberal. The recollection comes to the writer's mind of a premium system that was installed in certain departments of a packing house in New England and where such a plebian product as sausage was put on a premium basis. Boys had been employed at six dollars per week to tie sausages; the boys could not get out the goods in time, although more boys were employed than seemed necessary, and were in one another's way. With the introduction of the new plan the time allowance per hundred pounds was cut to a seemingly ridiculous price and for two or three weeks the boys could not make over a quarter of their regular pay. However, as time went on speed was gained and as a result two boys were able to turn out the goods in better condition than formerly was done with six boys and the two boys earned from $15 to $18 each. Sausages are not machinery, yet practically the same condition obtains in both shops, aside from the fact that machine work cannot, of course, be speeded up as much as the sausage operation could, yet machine work can be so handled as to make or lose money for the manufacturer as the employe sees fit. If it is made worth while the employe will do his part in making the operation a paying one for the manufacturer.

The rate-fixing bureau should be in charge of a practical man who is thoroughly competent to handle all details, and be assisted by a clerical force of about 2 per cent of total employes, one man in the factory taking time from every 100 employes, and one in the office attending to the office end of the work. On work on which a premium allowance is set, the name of parts and operations on the same must be standard; this appeals more forcibly to manufacturers who build a standard type of machine.

The best way to arrive at these names and operations is by holding a meeting of the foremen, consulting the drawings and deciding what names and operations shall be standard, and what department shall do the work. As operations are decided on, a record of them is made on a guide card ruled off for this special purpose. After all operations have been decided and recorded, the next step to be taken is the listing and setting of premium allowances. When sufficient data are on hand, this is readily accomplished, but where there are no data on any operation, then an estimate must be made, or a sufficient number of parts machined in order to arrive at an average.

If an average of different operatives' work on a certain operation is taken, then 10 per cent of the average should ordinarily be deducted and this will give a very liberal premium allowance to the workman. It will also insure the work being done in at least 10 per cent less time than the average, and the decrease in time may run as high as 25 per cent and over. In a great many cases it is not unusual for operatives to cut these time allowances as high as 50 per cent. Time once set should never be changed, unless a new jig or labor-saving device, or a rapid-cutting and self-hardening steel tool be introduced to simplify or expedite the work, and then only with great caution.

If a workman conceives the idea that if he makes too large a gain, the time will be cut on him, he will hold back on his work, and will only make a certain percentage of gain, where otherwise, if he had no fear of the time being cut, he will go ahead, work fast, and probably do the work in one-half of the time allowed.

When all the data have been obtained, and everything is in readiness for the introduction of the system, it is well to call a meeting of the workmen, explain the matter to them fully, inform them that good liberal time has been set on all operations, and that all who try can make a gain, that the time will not be cut on the work unless under the conditions cited above, but that all losses, on premium work, for which the workman is responsible, will be charged back to him and that he will only be paid for his net gain. This will cut out all chances of a workman spending too much time on a job on which he can only come up to the premium time or make a small percentage of gain. Workmen, unless they can make a liberal gain on any job, will not exert themselves to make any gain, and the result is a loss to themselves and the company. If workmen are charged with their losses and only paid their net gains, it will eliminate this and a workman will work as fast as possible on all work so as not to lose any percentage of what he has already gained. In a few plants the workman is paid his full rate for all time he gains while on premium work, while in the majority of plants he is only paid one-half of his total gain, and the latter seems to be the universal method of handling this subject.

If a workman is given a task to perform on which the time allowance is 12 hours, and he does the work in 10 hours, he has gained two hours, half of which is paid to him in wages. If the workman's rate is 25 cents per hour, and the day's work 10 hours, the workman, under the premium system, is making $2.75 per day by simply exerting himself, where otherwise he was only making $2.50 per day. This is a very small percentage of what the workman can gain; a good workman can average about 25 per cent increase on his wages. The employer, what is he making? In the case just cited, he is having work done for 25 cents, that, under normal conditions, would have cost him 50 cents in wages and his manufacturing expense for two hours. These are the benefits to be derived from the premium system both by the employer and employe, and as long as the men are treated in a fair and upright manner and offered inducements to exert themselves, just so long will this system be a success to both shop and man.

In a plant in which the premium system is about to be introduced great care and good judgment have to be exercised in order not to antagonize the workmen. Workmen, as a rule, are skeptical of any changes, and will fight the premium system or any other system vigorously in order to retard its introduction and it is not until they are thoroughly convinced that the system is a good thing for them that they accept it harmoniously and exert themselves to make all the additional wages possible.

If any opposition is met, an excellent way of overcoming it is by putting a few trusty men, in different parts of the factory, on premium work, and allowing them to make fairly good gains. They will talk about their gains, and in all probability they will exaggerate them, and the result will be that they will excite the envy of their fellow workmen, with the desired result that the opponents of this system will gradually begin to clamor for premium work. If the

[1]Seventh of a series of articles on Cost Keeping.

[2]Certified Public Accountant, Cincinnati.

system is introduced in this manner, it will be found that these few men who are first put on premium work will act as the yeast that will leaven the whole plant.

This article presupposes the existence or the contemplation of a cost system in the shop where the premium system is to be installed and that therefore many of the forms which are pre-requisite to a premium system will already be in existence or planned. A record of all parts made in the factory is kept in the production department on a card index. This record gives the following information: 1—Name of part and size. 2—Material. 3—Pattern number. 4—Drawing number. 5—Time required to manufacture. 6—Number made in lots. 7—Minimum stock to be carried. 8—Operations. 9—Departments in which operations are performed. 10—Premium time allowance. On the back of this card is shown the number being made in the factory, number of parts used, and number of parts in the stock-room at all times. This gives a perpetual inventory of stock on hand. When the production clerk receives orders to make up a lot of machines, he examines the card index to see what he has in stock and what parts will have to be made. He makes a record of what is to be made and turns the list of parts over to the clerk who fills out shop order tags and cost cards and forwards them to casting clerk, steel clerk and cost keepers, respectively.

A shop order blank consisting of a manilla tag is a good plan. This shop order tag gives the following information: 1—Shop order number. 2—Amount to be made. 3—Articles and size. 4—When material is wanted. 5—When article is to be finished. 6—Operations. 7—Departments in which operations are to be performed. 8—Premium time allowed on each operation. 9—Date when work must leave each department. The warehouse coupon can be on the bottom thereof and perforated as to be readily detached. A small blue print should accompany the tag, or better yet, be attached to it. The warehouse tag should show on the face the shop order, article, material wanted, amount, material, size, date delivered, and return to material clerk and on the reverse, date received, amount, balance in stock, and by whom counted.

When the shop order tag reaches the casting clerk, he notes date on which material is wanted and orders material from the foundry. On receipt of it he stamps date under heading, "Material Received." The tag is held by the casting clerk till date shown under "Material Wanted," when it is sent to the warehouse. The warehouseman counts out the pieces, and attaching shop order tag to them, sends the work to the department in which the first operation is to be done, after detaching warehouse coupon. The warehouseman enters the date and signs the coupon and forwards it to the casting clerk, who enters weight and cost on the back and forwards it to cost keeper. The cost keeper enters cost under material on cost card and files coupon away for any future reference, if necessary.

With the introduction of this tag a great deal of the foreman's work will be eliminated, and this will give him the opportunity of having more surveillance over his men which, naturally, has a tendency to increase the production of his department. It simplifies the foreman's work to such an extent that he has more time to attend to the workmen and watch the speed at which they are running their machines and see that they are doing the work accurately. Under this shop order tag system, a foreman does not have to puzzle his brains to find what he has to do to the work, or have to consult the blue print to see to whom he has to send it after he is done with it.

When work arrives in a department, the foreman reads the shop order tag, notes date when work must leave his department, turns it over to a workman, who does that class of work. The workman, while still on other work, gives the tag with blue print to a tool carrier, who gets tools from tool-room and deposits them on the workman's bench. When the workman finishes the job he is on, he has everything in readiness to go ahead on the next and no time is lost. When the work is finished, either before time or on the exact date specified, it is hauled to an inspector by a trucker. It is inspected and immediately forwarded to the next department, and so on through the different departments to the stock-room. When the finished material reaches the stock-room, it is counted, placed in its proper receptacle, and form on the back of the shop order tag is filled out and the tag sent to the production department. Entries are made from this shop order tag to a card ruled to record the operations, symbols, department and time consumed.

The cost card is made out at the same time as the shop order tag. When made out it is forwarded to cost keepers, who file it away according to the guide number. As time comes in from factory on this work it is posted on this card, which is kept on file till the finished shop order tag returns from the stock-room to the production department, when it is taken out and cost figured on this part. The operations and premium time allowances are entered on the cost card in the same manner as they are entered on the shop order tag; this saves the cost keepers having to write in operations, and it is also the means of checking any operation on which the premium is not figured. Should the cost keeper find an operation on a workman's time sheet on which no premium gain or loss is figured, and if the cost card shows a premium time allowance, he will immediately enter the same on the workman's time sheet and post the gain or loss on the cost card. The system of checking this should be so complete and the chance of missing a workman's premium gain so eliminated that no complaints should come from the workmen on this account. This is a point in which great care should be exercised, so as not to have any shortages in premium pay. Shortages in premium pay, no matter how small, will cause discord and dissatisfaction among the workmen and must be avoided if the premium system is to be operated satisfactory.

When the cost of any part is figured on the cost card the unit cost is transferred to comparative cost cards, where a record has been kept of all preceding costs, and where any discrepancy in cost will show up. Should an increase in cost over the previous lot be shown, a comparison of the two cost cards will show where the discrepancy took place and the cost department can notify the superintendent of the date, the operation and the workman who was responsible for the increase. Should a workman make a loss instead of a gain in his premium work, a slip showing details is made out and forwarded, through the superintendent, to the foreman of the department in which loss was made. The foreman of the department is required to make explanation, and if, in his opinion, the premium time set is too low, the mistake is immediately remedied and the workman given the benefit of the corrected time. If the time set is ample and the workman is responsible for the loss, then this time lost should be charged against his previous gains and the workman only paid for his net gains for that month. In cases where work is spoiled or bad castings are discovered on the first operation, they are immediately replaced on the foreman's order. These orders are forwarded from warehouseman to cost keepers and are posted as additional cost against work, a credit being allowed for value of scrap.

Notice of work rejected by inspectors is made out in duplicate by inspectors. The original is sent to the foreman, and the duplicate is sent, through the superintendent, to the cost department, where it is charged against workman's premium gain on that particular job. If the premium time allowance on this job is one hour each and workman has gained one hour on a lot of 12, this one hour's gain would be deducted from workman on account of having spoiled one piece, which would then show his record as having

done 11 pieces in 11 hours, or exactly on premium time allowance. When work is rejected by inspectors its value is figured in the cost and is distributed over the number that are finished good in lot. For instance: Twenty-five pieces may be finished good on one shop order and cost $1.00 each; on next lot only 20 were passed by inspector and five were rejected. After deducting value of scrap, etc., the cost of the remaining pieces may run up to $1.20 each.

Any ordinary plan of time keeping mentioned in the last article can be used in connection with the premium system. There are several very good mechanical contrivances on the market for computing premium earnings and where such a machine is used the increase or decrease, or, in other words, the gain or loss, can be mechanically computed on each individual time ticket and such gain or loss recorded on the summary so that at the pay time the two columns can be summed up and the net credit paid to the employe.

When premium wages are paid for any set period, the workman's weekly gain sheet is added and workman is paid one-half of his total gain. In a certain plant in which this system is in satisfactory use, workmen are paid their premium gains every four weeks; this, however, is left to the discretion of the employer, as under this system of timekeeping, premium gains can be paid weekly. It would be well, however, to keep three or four weeks' premium gains back at all times, in case any charges should come in against the workman's gain. If a man makes a gain of eight hours on a job and another workman, when the work comes to him has to spend two or three hours additional time in fixing up a job that should have come to him in first-class shape, the additional time spent by workman No. 2 is charged against the gain of workman No. 1.

TWO NEW TOLEDO PRESSES.

In the accompanying illustrations are shown two new presses recently designed and built by the Toledo Machine & Tool Co., Toledo. Fig. 1 illustrates a double pitman, double back geared power press, motor-driven, designed for the hot pressing and forming of couplings for oil pipes, and similar work, as well as for cold pressing. The frame is a one-piece casting weighing 2,900 pounds, the 20-horsepower motor being conveniently placed on the right hand side and to the rear. The clutch mechanism is of the three-engagement, automatic block type with gravity releasing mechanism. The crank shaft is 9 inches diameter, the fly wheel weighing 2,200 pounds and having a diameter of 60 inches. The stroke of the press is 8 inches; the distance from the bed to the slide with stroke and adjustment up is 30 inches; the adjustment of the slide being 4 inches. The area of the bed is 61 inches wide by 48 inches front to back; the distance from the floor to the top of the large gear is 11 feet 8 inches. The gearing is in the proportion of 30:1, the large gear being 85 inches diameter by 12 inches face and weighing 6,000 pounds. The total weight of the machine is 73,500 pounds.

The press shown in Fig. 2 was built for the S. F. Bowser Co., Ft. Wayne, Ind., for cutting large openings and perforating the rivet holes around these openings in heavy steel plate for oil reservoirs and tanks. The press is motor-driven, the motor being of 25 horsepower. The clutch mechanism is the same as is employed on the press shown in Fig. 1, and is fitted in addition with a positive cam actuated automatic stripper attachment for operating the stripper for punches. This movement is provided with rolls running in oil pockets, and held to the cams by means of four heavy springs on the rods connected with the attachment. The frame is of the four-piece construction with the arch and bed shouldered and bolted to the housings. Some of the dimensions of the press are as follows:

Bed to slide, stroke and adjustment up, 23 inches.
Stroke, 3 inches.
Diameter of shaft, 8 inches.
Proportion of gearing, 25:1.
Large gear, diameter, 72 inches.
Large gear, face, 10 inches.

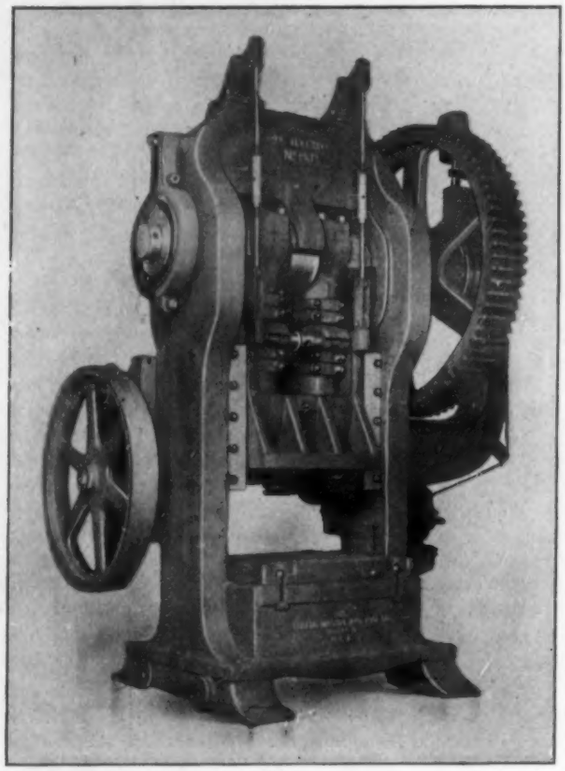


FIG. 1.—PRESS FOR FORMING COUPLINGS.

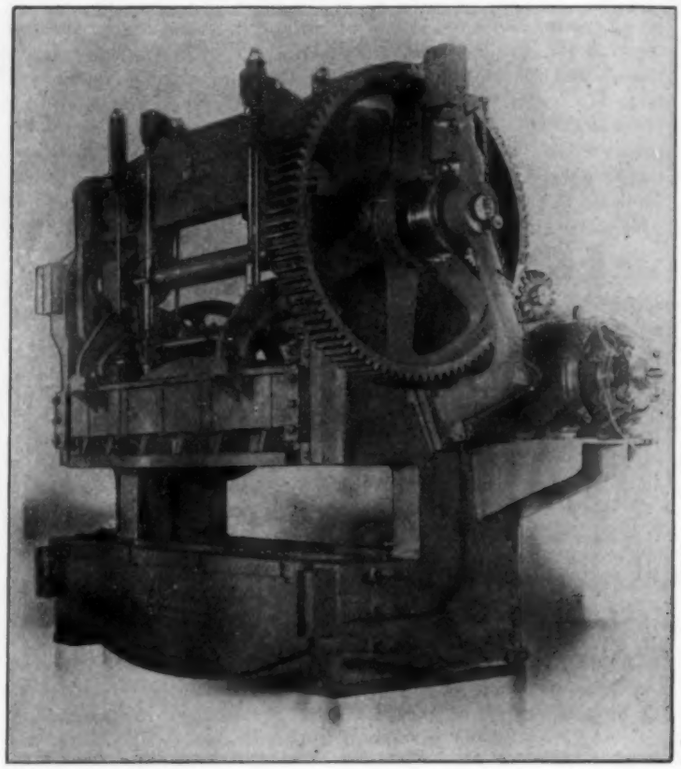
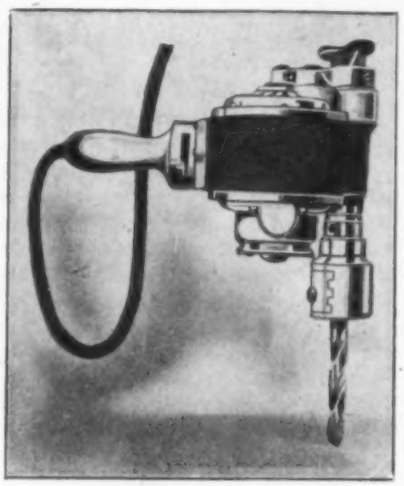


FIG. 2.—PRESS FOR PERFORATING TANK PLATES.

Weight of large gear, 5,000 pounds.
Fly wheel, diameter, 60 inches.
Fly wheel, face, 8 inches.
Weight of fly wheel, 2,200 pounds.
Distance between housings, 121 inches.
Area of bed, 120 x 32 inches.
Bed opening, 108 x 16 inches.
Weight of machine, 90,000 pounds.

THE LEKTRO PORTABLE DRILL.

The accompanying illustration shows the Lektro portable drill for which Fitch & Batcheller, 107 Liberty St., are the eastern agents. This drill is a portable electric tool, especially designed for working close and parallel to any surface, or in a corner. Its ability to drill close to a surface is limited only by the diam-



THE "LEKTRO" PORTABLE DRILL.

eter of the chuck. Four attachments can be used on the drill, namely, breast plate pressure feed, handle pressure feed, adjustable screw feed, adjustable chain and screw feed. The motor is designed to run sparkless from no load to a 25 per cent overload, and is so ventilated that the temperature rise above the surrounding air is 17 degrees Fahr. The chuck shaft is contained in the field magnet frame, thereby placing all pressure strain on the main casting. The screws and pinions are cut from bar steel and the armature shaft is of steel of large diameter and short length. Starting and stopping is controlled by a simple, solid switch self-contained on the motor frame and protected by aluminum handles, thus obviating any danger of shock to the user. The motors are wound for 220 or 110 volts, direct current. It runs at a constant speed giving an average cutting speed of the drill of 63 feet per minute. The tool is made in two sizes; the ⅜-inch size will drill a ⅜-inch hole in iron or steel, or a 1¼-inch hole in oak; the ½-inch size will drill a ½-inch hole in iron or steel, or a 1¼-inch hole in oak.

BOOK REVIEW

"Machine Shop Arithmetic," by Fred H. Colvin and Walter L. Cheney, New York. Published by Perry-Collard Co. 144 pages. Illustrated. 4 x 6 inches. Flexible cloth. Supplied by THE IRON TRADE REVIEW for 50 cents.

This pocket volume, which is in its fourth edition, presents in an elementary fashion suited to the needs of the apprentice in the shop, the simpler portions of arithmetic, including an explanation of common and decimal fractions, square and cube root extraction and various formulae for the finding of areas and volumes. A chapter is devoted to an explanation of the significance of formulae and their value, and the manner in which rules are expressed concretely by them. The adaptation of the principles of mensuration to figuring weights and strengths of materials is briefly indicated. The rules for selecting change gears and cutting threads, the determination of the depth of V threads and the various formulae for drilling for taps, showing the allowances necessary are briefly given. Simple rules for cutting speeds of tools and running speeds of gears and pulleys with directions for obtaining relative speeds through driving shafts are presented with a number of tables. The book should be a valuable one for elementary instruction and for the ordinary machine shop employe to become familiar with. The tables are well chosen and the book presents many of the advantages of a hand book.

Boiler Waters, by William Wallace Christie. New York. D. Van Nostrand & Co. 6 x 9 inches. 235 pages. 71 illustrations. Cloth. Supplied by THE IRON TRADE REVIEW for $3.00.

The author in this work presents much needed light upon a subject of great importance to all users of steam boilers. The subject of scale, corrosion and kindred evils in steam boilers has always been more or less vexatious, and many remedies have been proposed and tried, often without proper knowledge as to their effects on the part of those employing them. The present volume endeavors to show the principal causes of trouble in boiler waters and their remedies. The subject is treated in a comprehensive manner, and the book contains much information of value. It comprises 10 chapters, the first of which is devoted to water, its properties, impurities and analyses. This part of the subject is gone into very thoroughly, the various foreign substances being discussed from the chemical standpoint and from their effect on the steam boiler. Included in this chapter are tables giving the analyses of waters from a vast number of localities throughout the United States. The two following chapters treat of boiler scale and corrosion, respectively, the causes, effects and probable preventatives being pointed out. The succeeding chapters take up the subject of priming and foaming, the effect of oil, grease and zinc on boiler waters and on the boiler. In this chapter the beneficial results of using kerosene as a scale preventative are shown, but the dangers which may also accompany its use are pointed out as well. The hardness of water and the methods of its determination are the subjects of a separate chapter. Chapter VIII deals with water heaters, presents illustrations and descriptions of a large number of different varieties, and discusses the adaptability of the different types for various services. Chapter IX treats of water softening, and presents descriptions and illustrations of the various systems of water softening plants in commercial use. Chapter X presents tables of use in steam boilers, boiler operation, including steam tables and factors of evaporation.

EXPERT WORKMEN

Will Be Turned Out by Bethlehem Steel Co.'s Apprenticeship Courses.

A new apprenticeship course by which youths are expected to be trained to become experts with a full knowledge of the highest development of the iron and steel business has been established by the Bethlehem Steel Co. at its works at South Bethlehem, Pa. The movement which is one of great interest in the iron and steel industry is outlined by President Archibald Johnston of the Bethlehem company, as follows:

"The Bethlehem Steel Co. offers openings for boys and young men of sixteen and over to learn very useful and profitable trades. The present day need of intelligent, trained mechanics, metal workers, and artisans is so great that thinking people are only too anxious to see their sons safely placed in some such establishment as the steel company, where the variety of trades taught comprises almost every single one for which boys and young men are suitable.

"The course embraces thorough instruction in the rudiments of each trade, leading up through every detail until the apprentice is turned out a competent finished artist in his particular line. Among the long list of trades taught, the following are the most interesting: brass molding, both bench and floor work; iron molding; steel molding, bench and floor, green sand and loam molding; steel molding, bench and floor, green sand and matrix molding; blacksmithing, both anvil and structural; pattern making in all its branches; bricklaying of all kinds, and

in addition, something that few bricklayers ever get a chance to learn—that is, the laying of fire-brick and manipulation of fire-clays in the building up of furnaces; carpentry, in both the ordinary work of carpenters and the finer work closely allied to cabinet making; electric wiring, care of dynamos and batteries, electric motors and electric machines; steam-fitting in its most complicated forms, from the smallest one-eighth pipe up to huge sizes carrying hundreds of pounds pressure; tool making, comprising the making of the almost infinite variety of tools used on the different machines throughout the whole vast establishment.

Will Aid the Nation.

"Armor plate making, and projectile making are two of the apprentice courses —every American is intensely interested in our splendid navy and knows what this means; and when people talk of "the man behind the gun" they think of the "man that made the gun and the man that made the armor, too." The company offers also a chance for its bright boys to take up the study of draughting—the making of sketches, drawings and designs for which the machines, tools, guns and armor, patterns and moldings are made.

"The course is designed to turn out skilful, well trained, high grade mechanicians—not mechanics merely, but intelligent, high grade experts who have received the finest technical training that can be obtained either here or in Europe; —who know tools and how to use them; who know machines and machinery and how to make them and how to run them, too; experts who understand designs, sketches and drawings; who have been drilled in every detail of their art; masters of their craft. In addition the welfare of the apprentices in every line of work is under the special charge of a separate department, which watches jealously over the progress and well-being of each individual apprentice."

German Syndicate Output.—The output of the German Steel Syndicate in 1906, according to the *Iron and Steel Trade Review*, amounted to 11,079,000 tons of finished and semi-finished products, an increase of 2,127,084 tons over 1905. The production of tubes increased 45 per cent, forgings, railway axles, etc., 31 per cent; bars, 29 per cent; plates, sheets, shapes and semi-finished steel, each 22 per cent; rolled rods and wire, 21 per cent, and railway material 19 per cent.

A series of articles on the utilization of wood waste has been started by *The Lumberman*, St. Louis. On its completion it will be published in book form.

LARGE DIVIDENDS

Paid by Iron Companies in Great Britain.—Increased Exports.

February 14.

Our board of trade returns still show enormous increases. Pig iron, for example, was exported to the extent of 175,820 tons during January, as compared with 90,700 last year. Galvanized sheets show a slight decrease, but black plates for tinning total £72,100, as against £38,962 for 1906. Hoops and strip iron totalled £38,890, as against £28,869, and steel bars, angles, rods, etc., £265,957, against £188,427; tin plates and tin sheets £516,492, compared with £381,263.

Reports from the Derbyshire district are cheerful. The Staveley Coal & Iron Co. intends reopening its Farewell Pit, which has been closed for nearly 30 years, and which will now find employment for about 500 men. New blast furnaces are being built by the company, and one is to be opened in March. The scarcity of coke, which is a most serious matter, is compelling the opening and reopening of coke ovens. In some cases, blast furnaces have had to stop for want of coke, and this is the only circumstance that is preventing other furnaces from being blown in. Our largest companies are still issuing favorable reports. Henry Bessemer & Co. report a profit of £64,186 and recommend dividend, making with the interim dividend a distribution for the year of 22½ per cent. By the purchase of the Bolton Steel Works, the company gets rid of a formidable competitor in Lancashire. For the purpose of renovating the plant, it is proposed to increase the capital to £300,000 by the creation of 10,000 ordinary shares of £10 each.

Guest, Keen & Nettlefold, Ltd., have declared an interim dividend for the last half year of 5 per cent on preference shares, and 10 per cent on ordinary shares. This company continues its remarkable career of prosperity.

Great interest has been aroused locally by the amalgamation of the Eadie Manufacturing and the Birmingham Small Arms companies, mainly for the manufacture of cycles and motor parts. The interest for the iron and steel trade is the further evidence that these trades, which are large users of metal, are rapidly making Birmingham their principal headquarters.

The directors of the Birmingham Railway Carriage & Wagon Co. Ltd. have declared a dividend of 12½ per cent on ordinary shares for the half year, making 10 per cent for the year, with a bonus of 5 per cent, which increases it to 15 per cent. This important Birmingham industry seems to be prospering amazingly, and is still consuming large quantities of iron. All the local wagon companies have orders on their books to last them many months, and the Metropolitan Co. of Saltley is still producing an enormous output of vehicles.

Apparently, the local ironworks have been suffering from the frost, which is accountable for certain brittleness of machinery. At the Bromford Iron Works, lately, a large driving wheel smashed, the fragments flying in all directions, and a similar accident occurred last week at the works of Samuel Newton & Sons, Brierley Hill. The men were changing the rolls when a fly wheel 19 feet in diameter, and weighing 40 tons, snapped and flew into several pieces. The machinery was badly damaged, the steam pipes were broken, and the roof torn away. The entire damage will take five or six weeks to repair. A most remarkable circumstance is that in neither case did the workmen sustain the slightest injury.

Our Auto Production.—The total production of automobiles in the United States in 1905, according to a census report, was 22,830, valued at $26,646,064, as against only 3,723 in 1900 with a value of $4,748,011—an increase of about 461.1 per cent. Of the 21,692 autos turned out by automobile factories, 18,699 were propelled by gasoline; 1,568 by steam, and 1,425 by electricity. These figures represent the output of 121 establishments, and in addition, 1,138 autos were turned out by 47 plants engaged primarily in other lines of manufacture. Fifty-seven concerns manufactured automobile bodies and automobile parts to the value of $3,388,472. The amount of capital invested in these establishments increased from $5,768,857 to $20,555,247 in five years, and the average number of wage earners from 2,241 to 10,239. The value of American made automobiles and parts exported increased from $948,528 in 1902, to $2,481,243 in 1905. The 1905 census of the manufacture of bicycles and tricycles shows that since 1900 the number of factories declined from 312 to 101; the capital invested from $29,783,659, to $5,883,458; the number of wage earners from 17,525 to 3,319, and the value of products from $31,915,908 to $5,153,240.

No Gun Foundry.—The Provision for a gun foundry at the Washington navy yard, which was inserted in the naval bill in the form of an amendment, was separated into a separate proposition in the house of representatives, Feb. 15, and lost upon a strict party vote of 160 to 108. The naval bill was passed. The Pennsylvania members were active in securing the defeat of the amendment.

Investigation Affects Trading in Stocks.

Affected largely by the government investigation of the Harriman railroad system, the past week's stock market continued to display the irrational and feverish activity which has characterized its operation since the beginning of the new year. The market declined sharply in the early part of the week and on Wednesday showed a drop in the average price of over three points in three days and over 15 points since the beginning of the year. The general tendency was as previously, distinctly downward, and despite recovery from the lowest, the week showed general and many sharp net losses. The average railroad price Saturday reached the lowest point since 1905. The developments of the Harriman investigation have by no means tended to reassure timid investors in railroad stocks and public confidence has gone to a lower ebb, making correspondingly difficult the winning back of public favor which must precede the growth of strength in these securities. The retrenchment of intended improvements announced by the railroads has as yet failed to show in any degree the predicted contraction of general business conditions. The iron and steel and other basic industries of the country continue to show soundness and prosperity on every hand, tending to discount in a way the expected reaction of the future which the declining stock market, on its face, appears to be foretelling. The money market has been firm and the movement of currency has indicated the usual spring call of money for farming purposes. The bank statement was not of large significance, reporting an increase of $4,274,800 in loans, a decrease of $2,098,400 in reserve and a loss of $4,509,935 in surplus which is lower than in corresponding periods of recent years, except 1902. The favorable development of the week has been the passing by congress of the Aldrich financial bill which goes far toward remedying some of the serious effects of the present sub-treasury system. Iron and steel stocks generally have been weak, declines being general. Pennsylvania Steel gained four points while Virginia Iron, Coal & Coke showed a decided decline of 16 points and Colorado Fuel & Iron a decline of 4¼ points. United States Steel was active with sales of 359,700 common and 30,400 preferred. Total sales on the New York exchange for the week were 5,802,150 shares as against 5,271,400 for the corresponding week in 1906. Sales of railway and miscellaneous bonds aggregated $5,461,000, compared with $16,870,000 in 1906.

Financial Notes:—

March dividend disbursements by railroad, industial and traction corporations will reach the record-breaking total of $45,700,837, or an increase over the same month a year ago of $7,582,964. Of this sum industrial stocks furnish $30,936,632, as compared with $26,139,423 in 1906. The year to date shows gains aggregating $16,000,000 in industrial dividend payments over 1906.

Recent dividend declarations include 2½ per cent by the National Steel Casting Co., Montpelier, Ind.; 6 per cent by the H. A. Silver Foundry & Machine Co., Salt Lake City, Utah.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. Mar. 2	Changes In Week	Date 1907 Ann. Meet.	Stock Outstanding	Dividend Basis	Dividend Being Paid	Dividend Date Last Div. Pay.
Allis-Chalmers	13⅛	−1⅜	Sept.	19,820,000			
Allis-Chalmers pr	34½	−2¼		16,150,000	7 cum		Feb., 1904
American Can	7	+ ⅛	Feb.	41,233,300			
Am. Can pr	54⅜	− ⅛		41,233,300	7 cum	5 Q.	Jan., 1907
Am. Car and Fdy	43⅛	− ¼	June 27	30,000,000		½ Q.	Jan., 1907
Am. Car and Fdy pr	103	+ ¾		30,000,000	7 n. c.	7 Q.	Jan., 1907
American Loc.	72¼	−1¼	Oct. 5	25,000,000		1¾	Feb., 1907
American Loc. pr.	110½	.....		24,100,000	7 cum	7 Q.	Jan., 1907
American Ship.	74⅛	−2	Oct. 2	7,600,000	6	1 Q.	Mar. 1907
American Ship. pr.	108¾	.....		7,900,000	7 n. c.	1¾ Q.	Jan. 1907
Am Steel Foundries	8⅛	− ⅜	Oct. 1	15,810,000		.....	.....
Am. Steel Foundries pr.	42	−2		17,240,000	6 cum	.....	Aug., 1904
Barney & Smith	71	.....	June 4	2,000,000	4	4	Ma., 1907
Barney & Smith pr	138	.....		2,500,000	8 cum	8 Q.	Mar., 1907
Bethlehem Steel	18⅛	.....	April 2	14,882,000		.....	.....
Bethlehem Steel pr	50	.....		14,908,000	7 n. c.	5 Q.	Feb., 1907
Cambria Steel	43⅞	−1¾	Mar. 19	45,000,000*	6	3 Q.	Feb., 1907
Cambria Iron	48	.....		8,468,000*	4	4 S. A.	Oct., 1906
Chicago Pneumatic Tool	46	.....	Feb. 18	6,145,800	4	4 Q.	Jan., 1907
Colorado Fuel	43½	−4¼	Oct. 21	30,132,000		.....	Apr., 1902
Crucible Steel	93¾	− ½	Oct. 16	24,578,400		.....	.....
Crucible Steel pr	78	.....		24,436,500	7 cum	6	Dec., 1906
Empire Steel	8	+1	Feb. 27	2,281,400		.....	.....
Empire Steel pr	50	+3		2,500,000	6 cum	3 S. A.	July, 1906
Fay & Egan	95	.....	Feb. 19	1,000,000	6	7 Q.	eb., 1907
Fay & Egan pr	128½	.....		1,000,000	7 cum	7 Q.	Feb., 1907
General Electric	157½	−1	May 14	63,643,600	8	8 Q.	Jan., 1907
Harbison-Walker	11¾	− ¾	Jan. 21	18,000,000	6	.....	.....
Harbison-Walker pr	70	−4		9,600,000	6 cum	6 Q.	Jan., 1907
International Pump	34¾	+ ¾	June 4	17,762,500		2	Apr., 1905
International Pump pr	77¾	−2¼		11,350,000	6 cum	6 Q.	Feb., 1907
Lackawanna Steel	60	.....	Mar. 13	34,971,400		.....	.....
Lake Sup. Corp	14	−2	Oct. 2	40,000,000		.....	.....
New York Air Brake	134¾	− 3⅛	June 18	10,000,000	8	8 Q.	Jan., 1907
Niles-Bement-Pond	130	.....	Feb. 6	5,000,000	6	6 Q.	Mar. 1907
Niles-Bement-Pond pr.	105	.....		2,000,000	6 cum	6 Q.	Feb., 1907
Otis Elevator Co	47	−3	March 18	6,350,300		2 A.	Apr., 1906
Otis Elevator Co. pr.	93	−1		6,308,500	6 n. c.	6 Q.	Jan., 1907
Penn. Steel	66	+4	May 13	10,750,000		.....	.....
Penn Steel pr	103	−1		16,500,000	7 n. c.	7 S. A.	Apr., 1906
Pittsburg Coal Co	14⅜	−1⅛	Feb. 11	32,000,000		.....	Nov. .....
Pittsburg Coal pr	56⅜	−1¼		32,000,000	7	.....	Apr., 1905
Pressed Stl. Car	48¾	−2⅛	Feb. 20	12,500,000		3	Aug., 1904
Pressed Stl. Car pr	91	−1½		12,500,000	7 n. c.	7 Q.	Feb. 1907
Pullman	168	−2	Oct. 17	100,000,000	8	8 Q.	Feb., 1907
Railway Stl. Spring	51⅛	−1	Mar. 7	13,500,000		4 S. A.	Oct., 1906
Railway Stl Spring pr.	99⅛	− ⅜		13,500,000	7 cum	7 Q.	Mar. 1907
Rep. Iron & Steel	33	−1⅞	Oct. 9	27,191,000		.....	.....
Rep. Iron & Steel pr	98	− ⅝		20,416,900	7 cum	7 Q.	Apr., 1907
Sloss-Sheffield	67	−3	Mar. 5	10,000,000	5	5 Q	Oct., 1906
Sloss-Sheffield pr	72¾	.....		6,700,000	7 n. c.	7 Q.	Jan., 1907
Tenn. Coal & Iron	147	−3	May 7	22,553,060	4	4 Q.	Feb., 1907
U. S. Pipe & Fdy	45	− ½	June 26	12,500,000	4	4 Q.	Dec., 1906
U. S. Pipe & Fdy. pr	86⅜	.....		12,500,000	7 n. c.	7 Q.	Dec., 1906
U. S. Steel	43⅞	−1½	April 15	508,302,500	2 n. c.	½ Q.	Mar., 1907
U. S. Steel pr	103½	− ⅞		360,281,100	7 cum	7 Q.	Feb., 1907
U. S. Steel 5's	98½	− ⅜		463,788,000	5	5 A.	....
Va. Iron, Coal & Coke	71½	−16	Sept. 17	8,641,600		.....	....
Westinghouse Elec	150	.....	July 24	24,998,700*	10	10 Q.	Jan., 1907
West'ghouse Air Brake	156	.....	Oct. 1	11,000,000*		22½ Q.	Jan. 1907

Par value of shares, $100, except those starred, $50.

The American Can Co. has applied to the New York stock exchange to list $41,233,300 preferred stock and $41,233,300 common stock.

The Nova Scotia Steel & Coal Co.'s profits for 1906 aggregated $960,281, as compared with $559,906 in 1905.

Stockholders of the Hall Signal Co. have rejected the plans submitted by the directors which involve an increase in capitalization from $2,000,000 to $10,000,000 and the merger of the old company in a new holding concern. The directors have therefore abandoned the plan and will shortly submit another to the stockholders for the reorganization of the company.

Pennsylvania corporation capital increases include the Westinghouse Machine Co., East Pittsburg, from $4,257,900 to $7,579,300; the United Iron & Steel Co., Pittsburg, from $5,000 to $2,000,000; the Erie Electric Motor Co., Erie, from $150,000 to $1,000,000; the Sheldon Axle Co., Wilkesbarre, from $350,000 to $750,000, and the Standard Gauge Co., Beaver Falls, from $180,000 to $300,000.

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Linton Rolling Mill Co., Linton, Ind., has increased its capital stock from $40,000 to $100,000.

The Bucyrus Steel Casting Co., Bucyrus, O., has increased its capital stock from $100,000 to $200,000.

The National Iron Works, Spokane, Wash., has increased its capital stock from $15,000 to $60,000.

The Murray Machine Co., Des Moines, Ia., has recently been incorporated by Thomas Murray, F. B. Alldredge and Dallas E. Alldredge.

The Marion Machine, Foundry & Supply Co., Marion, Ind., has been authorized to operate in Illinois, with a capital of $5,000.

A. R. Curtiss & Co., Champaign, Ill., have been incorporated with a capital of $50,000 by Albert R. Curtiss, Morgan Brooks and Adolph F. Swanson.

The Washington Sheet Metal Works, Seattle, Wash., has been organized with a capitalization of $12,000 by G. J. Long, Oscar Witt and W. H. Berry.

The Hisey-Wolf Machine Co., 852 Spring Grove avenue, Cincinnati, has increased its capital stock from $20,000 to $100,000 for the purpose of extending its facilities.

The United Spinning Machinery Co., Boston, Mass., has been organized with a capitalization of $750,000 by William D. Wright, Charles Anderson and Richard S. Phillips.

The Boss Washing Machine Co., Cincinnati, has been organized with a capitalization of $200,000 by W. C. F. Dietz, Charles Dietz, Louisa B. Dietz, F. B. Dietz and Frank H. Kunkel.

The Pressed Steel Sanitary Mfg. Co., Detroit, Mich., has been organized with a capitalization of $400,000, and will build a factory 100 x 180 feet. DeWitt Loomis is general manager.

The Sharpsville Boiler Works, Sharpsville, Pa., has been organized with a capitalization of $10,000 by Philetus C. Reed, Francis W. King, W. H. Rumbaugh, of Sharpsville, and Wallace E. Shipley, of Sharon.

The Judge Machine Co., Baltimore, Md., has been incorporated to manufacture, sell and deal in all kinds of machines. The capital stock of the company is $250,000, and the incorporators are: Emanuel H. Miller, John S. Lusk and Max Raufman, all of Baltimore.

The Automatic Train Control Co., Indianapolis, Ind., has been organized with a capitalization of $12,000 to make a device for automatically controlling locomotives and trains. The incorporators are: John E. Stiegelmeyer, Carey L. Smith, Orion V. Beckwith, William E. Hayward and Charles H. Pierce.

The Fountaine Gas Steam Radiator Attachment Co., Elkhart, Ind., has been incorporated to manufacture Fountaine gas radiators, parts and supplies. The capital stock of the company is $30,000, and the incorporators are: Robert H. Hotchkin, Dana H. Hotchkin and Charles W. Pitts.

J. J. Reilley and Frank J. Doyle, proprietors of the Columbus Iron Stores Co., Columbus, O., have organized the American Castings Co., for the manufacture of brass castings for automobiles and other similar purposes. The castings are treated to a special patented process.

The Jenney Safety Switch Co., Westfield, Mass., has been incorporated with a capital of $100,000 by Walter R. Jenney, Charles H. Beals, John C. Teahan, of Westfield; Charles A. Sibley, of New Haven, and E. E. Stone and Charles A. Firth, of Springfield. The company will manufacture the new safety railroad switch designed by Mr. Jenney.

New Construction:—

The Halcomb Steel Co., Syracuse, N. Y., is completing additions to its plant started some time ago.

Plans are being prepared for a new $35,000 plant to be erected for the Modern Tool Co., Erie, Pa.

The Hondo Foundry & Machine Co., Hondo, Tex., is erecting a new building. All the necessary equipment has been purchased.

The Olds Gas Power Co., Lansing, Mich., has let the contract for a small addition to its foundry. All of the material and equipment has been purchased.

The Iowa Radiator Co., Cedar Rapids, Ia., is planning the erection of three buildings, a foundry, machine shop 50 x 200 feet, and a boiler room 40 x 40 feet.

The Stephen-Adamson Co., Aurora, Ill., has purchased land adjoining its present plant and will erect a large foundry costing between $25,000 and $35,000.

The contract for the large plant which the Griffin Car Wheel Co. will build on 10 acres of land at Pullman, Ill., has been let to R. & S. Sollitt, Pullman building, Chicago. The buildings and equipment will represent an outlay of $1,000,000.

The Buckeye Foundry Co., Cincinnati, is considering plans for a new machine shop adjoining its present plant. The proposed structure is to be of brick, 90 x 150 feet, two stories high.

The Star Iron Works, Lima, O., has gone into the business of repairing and rebuilding locomotives. Extension to the plant to accommodate this line of work is now being considered.

The South Baltimore Steel Car & Foundry Co., Baltimore, Md., has completed the rebuilding of the axle and wheel shop which was destroyed by fire Feb. 17, and operation has been resumed.

The American Steam Pump Co., Battle Creek, Mich., has awarded the contract for a large addition to its works, which will be used as a machine shop. The new addition will furnish employment for 200 men.

The bolt mill of the Fort Worth Iron & Steel Co., Fort Worth, Tex., which escaped the fire that recently damaged the plant, has resumed operations. New buildings are now being erected to take the place of those destroyed.

It is announced that work is to be continued on the new merchant mill of the Minoqua works, Pueblo, Colo. The mill, when complete, will be 280 feet wide and over 1,000 feet in length, and will manufacture all kinds of structural steel.

The Atlas Laundry Machinery Co., Cincinnati, manufacturer of laundry machinery, is at present conducting its business at the gas engine plant of the Frank M. Watkins Mfg. Co., Sixth and Baymiller streets, but expects to build later, possibly next fall.

The Smith Improved Lock Nut Co., Rockford, Ill., has prepared plans for a new factory which it will erect in that city. The new building will be 75 x 200 feet, one story, of brick construction. The extension will increase the output of the present plant about five times.

The Epping-Carpenter Co., Pittsburg, has purchased 40,000 square feet of ground adjoining its present plant on account of its rapidly increasing business. A two-story steel addition, 72 x 104 feet, which is to be used for an erecting shop, will be built on the property just purchased.

The Samuel C. Tatum Co., manufacturer of copying presses, stationers' hardware, binders' and printers' machinery, Cincinnati, is having plans drawn for a new plant, the main building of which will be 366 feet in length, four stories and basement. There will be a foundry building 110 x 300 feet, with separate power plant and pattern storage buildings. For nearly 50 years the company has been located at Water, John and Front streets. Its new location will be on Colerain avenue, in the western part of the city.

The American Blower Co., Detroit, Mich., manufacturer of engines, heaters, blowers, mechanical draft apparatus, etc., is putting the finishing touches upon a

large addition to its steel plate fan shop. The new building will be occupied in about 30 days. The company's architects are now at work on a large addition to the power plant and the engine construction department. The concern has expanded rapidly for years until now it has no more ground left on its present site to grow on. It has shown a great growth in its business annually for the past several years.

The Bonny-Floyd Co., recently incorporated with a capital stock of $100,000 to establish a plant for the manufacture of steel castings in Columbus, O., has let the contract for the erection of the first building of the plant to the Pittsburg Bridge & Iron Works. This building will be entirely of steel and will contain 8,000 square feet of molding space. It will be 106 x 132 feet at its widest point and 72 feet wide at its narrowest point. The company has purchased several acres on South Parsons avenue for its plant and it expects to have its first building up and ready for operation by May 1. It will then commence turning out castings in limited quantities. The other buildings of the plant will be erected during the summer. The company will make a specialty of medium and small castings such as are used in the manufacture of cars, automobiles, etc.

General Industrial Notes:—

The Macneale & Urban Safe Works, Hamilton, O., was sold at receiver's sale, Feb. 27, to the Mosler Safe Co. for $41,000.

The new extension of the structural shop of the Case Mfg. Co., Columbus, O., is about completed and the company expects to have it in operation by April 1.

The Ralston Steel Car Co., of Columbus, O., is considering the advisability of putting in a wood working department with a view to constructing box cars in connection with its steel drop-bottom gondolas.

The Portsmouth Pressed Steel Works, Portsmouth, O., has resumed operations after a period of idleness. The company has been reorganized by Carl Ricker, who is at the head of the concern.

The Maag-Wahmann Co., Baltimore, states that its recent incorporation is merely a continuance of the business of August Maag. By a decree of the court the firm was compelled to change its name. The company will operate the same as in the past.

The Chicago Pneumatic Tool Co., at its annual meeting of stockholders in Chicago, re-elected the following officers: President, J. W. Duntley; first vice president and general manager, W. O. Duntley; second vice president, S. W. Prince; secretary, W. B. Seelig.

The Reading Standard Cycle Mfg. Co., Reading, Pa., recently organized, reports that it will engage in the manufacture of motor bicycles, bicycles and bicycle parts. For the present no new building is contemplated, the factory being ample for immediate requirements.

The National Foundry Co., Erie, Pa., which during the past year constructed one of the most modern open-hearth steel casting plants in the country, made its first heat the past week. The start was very successful. The various departments of the plant are under the direction of men of wide experience.

The Peru Plow & Wheel Co., Peru, Ill., whose plant was recently damaged by fire, is preparing to rebuild the damaged portions as rapidly as possible. Orders are being placed for the new equipment required. That part of the plant which was not touched by the fire has resumed operations.

The Solvay Foundry Co., Syracuse, N. Y., has elected the following directors: Fred Frazer, Charles R. Jones, H. S. Holden, W. W. Wiard and O. P. Letchworth. The officers are: President, Fred Frazer; vice president, O. P. Letchworth; secretary and treasurer, Charles R. Jones. The company's new plant is now in operation.

The Constantine Mfg. Co. has taken over the business of the Tweedale Foundry & Machine Co., Constantine, Mich. The company is composed of Charles Cohn, Constantine; C. E. Fousel, Centerville; Luther Sevison, Port Huron, and D. L. Chipman, Peoria, Ill. The company will continue to make washing machines and do all kinds of castings.

William K. Field, Columbus, O., was elected president of the new Pittsburg Coal Co., a subsidiary corporation of the Pittsburg Coal Co., at the annual meeting, to succeed Francis L. Robbins, retired. The directors chosen are: W. H. Taylor, W. R. Woodford, Pittsburg; W. K. Field, E. C. Morton, Columbus, and G. C. Wetzell, Logan, O.

The Rochester Automatic Boiler Feed Co., Rochester, N. Y., states that it will manufacture several new patented machines ,especially an automatic boiler feed which feeds water to steam boilers, dispensihg with pumps and injectors. The machine shop will be equipped at once, but it is not expected to erect any buildings for at least one year.

The Kewanee Boiler Co., Kewanee, Ill., at its annual meeting, elected the following directors: E. E. Baker, B. F. Baker, J. P. Dugger, C. V. Kellogg, W. A. Cameron and M. F. Moore. The officers chosen were: President, E. E. Baker; vice president and treasurer, B. F. Baker; secretary, J. P. Dugger. M. F. Moore was reappointed assistant to the president and W. D. Glidden, cashier.

Structural work for railroad bridges is being put out in large quantities by the Mt. Vernon Bridge Co., which has its headquarters in Columbus, O. President James Westwater says the company has contracted in the past few weeks for $100,000 worth of new work. Most of this is for bridges on the Clover Leaf, T. & O. C., Baltimore & Ohio and C. A. & C. Large extensions have been added to the company's plant at Mt. Vernon. It now makes 110-ft. steel plates and girders, weighing 40 tons each.

Trade Notes:—

The Pittsburg Automatic Vise & Tool Co., Pittsburg, manufacturer of automatic vises, has just been allotted the contract by the United States government for vises to be shipped to Panama. In filling this tropical order the company is employing its best endeavors to build a tool especially adapted for the climate and conditions.

The Canton-Hughes Pump Co., Canton, O., has recently effected an arrangement with the Moore & Handley Hardware Co., Birmingham, Ala., to control the sale of its pumps for Birmingham and the surrounding territory. The Moore & Handley Hardware Co. will have exclusive sale and carry a complete stock of pumps at all times, purchasing in car load lots, and will at an early date be prepared to fill orders for pumps very promptly.

The firm of Dalton, Nash & Co., pig iron dealers, has been dissolved by mutual consent, Mr. Dalton retiring. The business will be continued at 82 Beaver street, New York City, by Nash, Isham & Co., of which A. L. Nash and Phillips Isham will be the partners. The latter firm will continue to represent the companies formerly represented by Dalton, Nash & Co.

Fires:—

The plant of the Barnes Brass Lock Co., Bayonne, N. J., was destroyed by fire Feb. 24.

The Manhattan Screw & Stamping Co., New York, sustained a heavy loss by fire Feb. 21. Several other firms, at 61-71 Greenwich street, were also heavy losers.

The wholesale hardware house of the Baldwin & Robbins Co., Inc., Boston, sustained a loss of about $100,000 by fire Feb. 23, when its four-story building was destroyed.

The wire drawing plant of the Wire & Telephone Co. of America, Rome, N. Y., was destroyed by fire Feb. 23, with a loss of about $100,000. Plans are being prepared for rebuilding.

TRADE PUBLICATIONS.

Drills.—Cleveland Twist Drill Co., Cleveland, catalog 34 of high speed drills, 24 pages, 6 x 9 inches, illustrated. Suggestions on the use of this tool are given together with the various sizes and styles.

Oil Cups.—Automatic Oil Cup Co., Milwaukee, catalog of the Bangs automotic oil cup, 11 pages, 6 x 9 inches, illustrated. Shows application of this well known cup, presents types and sizes for various services and gives a number of testimonials.

Arbor Press.—Edwin E. Bartlett, 364 Atlantic Ave., Boston, catalog of the Greenerd arbor press, 16 pages, 4 x 9 inches, illustrated. Gives capacities and uses of this press, together with a table of dimensions and weights. A number of concerns using this press is listed.

Steam Turbine Blowers.—Kerr Turbine Co., Wellsville, New York, Bulletin No. 2 of the Kerr steam turbine blower, 15 pages, 6 x 9 inches, illustrated. The various parts of the turbine are described in detail and a table of capacities, dimensions and weights is also given.

Rock Drills.—Ingersoll-Rand Co., New York, No. 46. 84 pages, 6 x 9 inches, 92 illustrations. Rand drills in this catalog are fully described in all their details and full information is given as to sizes, capacities and other desired particulars including prices. The various drill mountings and appurtenances are described and full lists of all repair parts are given. Some of the other products of the company are briefly mentioned and a list is given of the great variety of catalog matter now issued by this company.

Steam Engines.—American Blower Co., Detroit, Mich., catalog 206, 7 x 9 inches, 60 pages. Illustrates and describes vertical self-oiling steam engines of various types for different services. It gives detailed descriptions of the engines, illustrated by sectional views and line drawings, and presents tables of dimensions and horsepower, lists of parts, etc. The engines are of the self-oiling vertical type ranging from 2 to 125 horsepower and are adapted for operating blowers, electric generators and similar services.

Air Compressor Outfits.—The Abenaque Machine Works, Westminster Station, Vt., is distributing a 6 x 9 pamphlet of eight pages, describing and illustrating portable gas or gasoline-driven, direct-connected air compressor outfits. The apparatus illustrated comprises a 12-horsepower engine direct-connected to an 8 x 8-inch compressor of sufficient size to maintain a pressure of 100 pounds per square inch and to furnish 75 cubic feet of free air per minute.

RAILROAD CONTRACTS

Awarded by the Canadian Government.—News of Plants.

Toronto, Canada, March 5.—Contracts have been awarded by the Canadian government for the construction of 457 miles of the eastern section of the National Transcontinental or Grand Trunk Pacific railway. The eastern division of the line from Moncton, N. B., to Winnipeg is being constructed by the National Transcontinental commission on account of the government, and when completed will be leased to and operated by the Grand Trunk Pacific Railway Co. The western division from Winnipeg to the Pacific coast is being constructed by the Grand Trunk Pacific Railway Co. This company tendered for the contracts just awarded on the eastern division and secured the work on three sections covering 245 miles. The tenders were awarded as follows: No. 1, from Moncton, N. B., west 50 miles to a point near Chipman, N. B., to the Grand Trunk Pacific; No. 2, from Grand Falls, N. B. west to the Quebec boundary about 62 miles to Lyons and White, Ottawa; No. 3, from the Quebec bridge east to the New Brunswick boundary about 150 miles to M. P. and J. T. Davis, Ottawa; No. 4, from La Tuque, Que., west to Weymontachene, about 45 miles to the Grand Trunk Pacific; No. 5, from a point eight miles west of Abitibi river, easterly about 150 miles to the Grand Trunk Pacific.

The cost of the whole 457 miles according to the terms of the tenders accepted will be about $13,000,000, making the average cost of construction per mile a little over $30,000. There are already under construction on the eastern or government division of the road 395 miles, which in addition to the contracts just let make a total of 852 miles or about half the distance between Moncton and Winnipeg. The route for the section between Chipman and Grand Falls, N. B., has not been definitely decided upon by the commission.

The reason assigned for the Grand Trunk company entering the field as bidders on the government division of the road is that when the company takes over the line, it will be subject to a rental based upon cost of construction and it accordingly desires to keep the figure as low was possible.

The Grand Trunk railway is relaying its double track between Toronto and Hamilton, a distance of 38 miles with 100-pound steel rails instead of the 80-pound now in use.

The Merner Mfg. Co., Ltd., has been incorporated to manufacture engines, agricultural implements and machinery at Alliston, Ont., with $300,000 capital by Samuel Merner, Absalom Merner, Herbert S. H. Merner, Hilda E. Devitt and Edward M. Devitt.

The Trussed Concrete Steel Co., Ltd., has been incorporated by Gustave Kahn, Douglas C. Raymond, Wm. Franklin Evans and Geo. B. Reynolds with $200,000 capital and head office at Walkerville, Ont.

The Shawinigan Falls Terminal railway, operating railroads at Shawinigan Falls, Que., which form a connecting link between the Canadian Northern and St. Maurice Valley systems, has given the Canadian General Electric Co., Toronto, a contract for a 600 horsepower electric locomotive. It will be operated from the lines of the Shawinigan Water & Power Co. for moving freight cars and will be the first locomotive of this type to be used in Canada.

The Woods Western Co., Winnipeg, under the same control as the Woods Co., Ottawa, Ont., manufacturer of lumbermen's and contractors' supplies, will erect a $200,000 factory at Winnipeg for producing the same lines of goods.

The Portage Iron & Machine Co., local agents at Portage la Prairie, Man., for the Huber Mfg. Co., Marion, O., manufacturer of farm machinery, will establish a large factory, arrangements having been made between the two firms by which the business will be transferred to Portage la Prairie.

J. H. Plummer, president of the Dominion Iron & Steel Co., Sydney, N. S., states in regard to the project for the company mining its own coal that options have been obtained upon three or four areas containing a large supply. These are now being examined and tested. Two drills are at work and on one property the outcrop is being opened up.

PROPOSE PRISON PLANT.

A bill is pending in the Missouri legislature with a fair chance of passage to establish a steel plant in the penitentiary at Jefferson City. It is the purpose of the framer to have the convicts manufacture bridge material for the county highways and in making such other structural material as the counties would likely need for public buildings, etc. At present the bill carries an appropriation of $30,000 to establish the plant, but it will be amended so as to increase this amount to $50,000 with a fund of $100,000 to buy material and keep the plant in running order. The convicts are now hired out to private factories in the penitentiary at so much per man.